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Elizabeth Macpherson

Publications en
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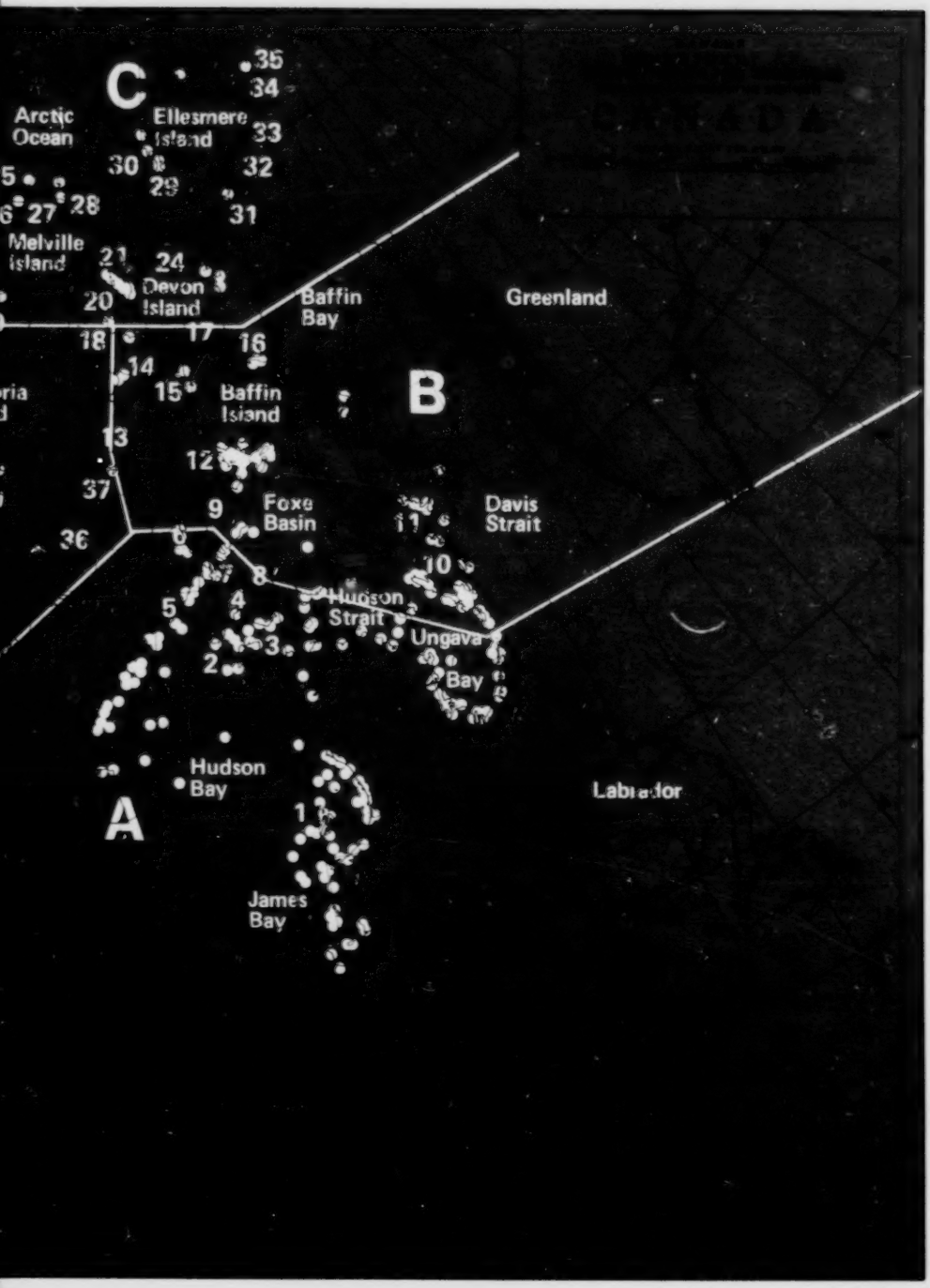
1. Belcher Islands
2. Evans Strait
3. Fisher Strait
4. Southampton Island
5. Roes Welcome Sound
6. Repulse Bay
7. Frozen Strait
8. Foxe Channel
9. Melville Peninsula
10. Frobisher Bay
11. Cumberland Sound
12. Fury and Hecla Strait
13. Boothia Peninsula
14. Prince Regent Inlet
15. Admiralty Inlet
16. Eclipse Sound
17. Lancaster Sound
18. Barrow Strait
19. Viscount Melville Sound
20. Wellington Channel
21. Penny Strait
22. Crozier Channel
23. Prince Patrick Island
24. Jones Sound
25. Borden Island
26. Wilkins Strait
27. Prince Gustaf Adolf Sea
28. Ellef Ringnes Island
29. Eureka Sound
30. Nansen Sound
31. Smith Sound
32. Kane Basin
33. Kennedy Channel
34. Hall Basin
35. Lincoln Sea
36. Chantrey Inlet
37. James Ross Strait
38. M'Clure Strait
39. Dease Strait
40. Melville Sound
41. Bathurst Inlet
42. Coronation Gulf
43. Dolphin and Union Strait
44. Darnley Bay
45. Prince of Wales Strait
46. Franklin Bay
47. Liverpool Bay
48. Mackenzie Bay
49. Herschel Island

Map 1

Geographical Distribution of Recorded Specimens



A. Southeast region
B. Northeast region
C. North region
D. Northwest region

The Marine Molluscs of Arctic Canada

Prosobranch Gastropods, Chitons and Scaphopods

National Museum of Natural Sciences
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Oceanography, No. 3

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The Marine Molluscs of Arctic Canada

Prosobranch Gastropods, Chitons and Scaphopods

by Elizabeth Macpherson

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Résumé

On a réussi à identifier 108 espèces de gastéropodes prosobranches, chitons et scaphopodes dans la région comprise entre le détroit d'Hudson, la baie James, l'île Herschel et le nord de l'île Ellesmere. Six espèces ne sont connues que par des coquilles vides, et 11 n'ont été consignées qu'une seule fois. Chaque nom d'espèce est accompagné de synonymes, d'une description, d'une représentation, et d'aires géographiques. Le gros des gastéropodes de l'Arctique consiste en de petits organismes à coquille mince; ils comptent pour une faible proportion de la biomasse totale de l'épifaune benthique. La plupart sont répartis sur un vaste secteur et se retrouvent dans presque toutes les eaux marines septentrionales; ils sont adaptés aux étés courts, aux hivers longs, aux très basses températures et aux salinités variables. Parmi ces adaptations, on remarque dans certains cas de gros oeufs riches en vitellus, des larves non pélagiques et, peut-être, un métabolisme élevé. Plus de la moitié des prosobranches de l'Arctique canadien sont carnivores, et un tiers de toutes les espèces de cette région appartiennent à la famille des Buccinidae. La faune intercotidale de l'Arctique est maigre comparativement à celle des latitudes inférieures.

Plus de la moitié des espèces étudiées habitent la zone circumboréale, les autres ayant une aire de type "Arctique-Atlantique" ou "Arctique-Pacifique". Environ 34 espèces vivent dans la baie d'Hudson, et six jusque dans la baie James. Six pour cent environ ne se trouvent que dans le bas Arctique, au Canada, et encore cinq pour cent se rencontrent surtout dans l'extrême Arctique; la majorité des autres ont une répartition panboréale.

Summary

One hundred and eight species of prosobranch gastropods, chitons, and scaphopods are reported from the region between Hudson Strait, James Bay, Herschel Island, and northern Ellesmere Island. Six species are known only as empty shells and 11 are single records in the literature. Synonyms, a description, a figure, and geographical distributions are given for each. Arctic gastropods are for the most part small, thin-shelled animals and form a small proportion of the total biomass of the benthic epifauna. The majority have very broad distributions, occurring in most northern marine waters, and are adapted to short summers, long winters, negative temperatures, and varying salinities. Such adaptations include in some cases large yolky eggs or nurse eggs, non-pelagic larvae, and perhaps a high metabolism. More than half of the prosobranchs in arctic Canada are known to be carnivores and one third of all the species found here are in the family Buccinidae. The intertidal zone supports a meagre fauna in the Arctic compared to that in lower latitudes.

More than half the species discussed are circumarctic and the rest have an "Arctic-Atlantic" or "Arctic-Pacific" pattern of distribution. About 34 species live in Hudson Bay and six even in James Bay. About six per cent are restricted to the Low Arctic in Canada and another five per cent are known mainly from the High Arctic. Most of the rest have a panarctic distribution.

Приводится 108 видов прозобранховых гастропод, хитонов и лопатоногих моллюсков из района, расположенного между Гудзоновым проливом, заливом Джеймса, островом Гершеля и северной частью острова Элсмира. 6 видов известны только в виде пустых ракушек, а 11 упоминаются в единичных записях в литературе. Синонимы, описание, рисунки и географическое распределение даны для каждого вида. Арктические гастроподы, в большинстве случаев, маленькие животные с тонкой раковиной; они составляют малую долю общей биомассы данной эпифауны. Большинство из них имеют широкий ареал, встречаются в большинстве бассейнов северных морей, приспособлены к короткому лету, долгой зиме, температуре ниже нуля и разной степени солености воды. Такого рода приспособления включают в некоторых случаях большие желтковые яйца, нелагические личинки и, возможно, исключительный обмен веществ в организме. Больше половины прозобранхов арктической части Канады известны как плотоядные, а одна треть всех видов, находящихся здесь, принадлежит к семейству Buccinidae. Заливаемая приливом береговая полоса поддерживает скудную фауну Арктики, если ее сравнить с фауной низких широт.

Что касается характера распространения, больше половины рассмотренных видов являются приполярными, а остальные «арктическо-атлантическими» или «арктическо-тихоокеанскими». Примерно 34 вида живут в Гудзоновом заливе, а 6 даже в водах залива Джеймса. Приблизительно 6% приурочены к нижне-арктической части Канады, а 5% известны только в районе высокой арктики. Большинство остальных видов имеют панарктическое распределение.

Introduction

The first collections of molluscs from Canadian arctic waters were made in the nineteenth century by officers of expeditions seeking a Northwest Passage. Such exploring parties, and those later searching for traces of Franklin's lost crews, were in fact responsible for most of the pioneer work on the natural history of the region. Other early collections were obtained by explorers from Britain, Norway, Denmark, and Germany. Only in the twentieth century has Canada supported scientific expeditions to her arctic territories. Among the first were the voyage of the *Neptune* (1903-04) and the Canadian Arctic Expedition (1913-16), both of which contributed to scientific collections. Whalers, adventurers, geologists, and biologists have added to the information available on the molluscan fauna by collecting specimens in the course of their work in the Canadian Arctic. From collections made in Canada, New England, Greenland, Scandinavia, and the then Russian Arctic, naturalists were able to describe by 1882 almost all species of marine gastropods living in the Canadian Arctic today.

Collections of the Fisheries Research Board of Canada, assembled over a 20-year period, and the results of dredging for molluscs by S.D. MacDonald in the High Arctic and A.H. Clarke in Hudson Bay, have made sufficient material available at the National Museum of Natural Sciences to make a survey possible. This work provides the first general reference on prosobranch gastropods, chitons, and scaphopods of arctic Canada.

Of the 108 species included in the synopsis, 28 are recorded from the region for the first time. A few species known from adjacent regions can be expected to turn up in future collections. The taxonomy of most groups has been established at the species level, and important synonyms are given. Each record in the literature is considered. The distribution in arctic Canada of each species is presented and the zoogeographic relationship of this fauna to that of other northern regions is discussed.

Materials and Methods

The region studied is bounded on the southeast by Hudson Strait and the Atlantic Ocean and on the southwest by the border of the Yukon Territory with Alaska. The northern limits are the Canadian territorial waters, and the southern limit is James Bay. In order to list localities in a systematic manner, the area has been divided into four regions (Map 1). Locality names are as in the Gazetteer of Canada series (1958, etc.).

Most of the 20,000 specimens examined are preserved in alcohol. Many of the rest are shells with dried bodies; others are empty shells and beach litter. Of the latter, only fresh-looking specimens are recorded. The genera used are mainly as given in Wenz (1938-44) and *The Treatise of Invertebrate Paleontology* I (1960). Descriptions, figures, and distributions are prepared using mainly the material examined. Species known only from the literature are mapped but not described. I have attempted to include all records of the species in these groups of molluscs from arctic Canada.

An asterisk marking localities in the lists of "Canadian Arctic literature records" indicates that I have re-examined the specimens referred to. Arabic numerals following localities in the lists of "Origin of specimens" refer to the number of specimens examined.

Biographical Note

Elizabeth Macpherson, born in Budapest, Hungary, spent her childhood in Montreal where she later obtained a Bachelor of Science degree at McGill University. After graduation she was employed by the National Museums of Canada and also spent three seasons in arctic Canada, partly engaged in collecting birds, mammals, fish, molluscs and plants. The challenge of undertaking research on mollusc taxonomy and zoogeography then absorbed her and she is now investigating the taxonomic relationships of whelks.

Acknowledgments

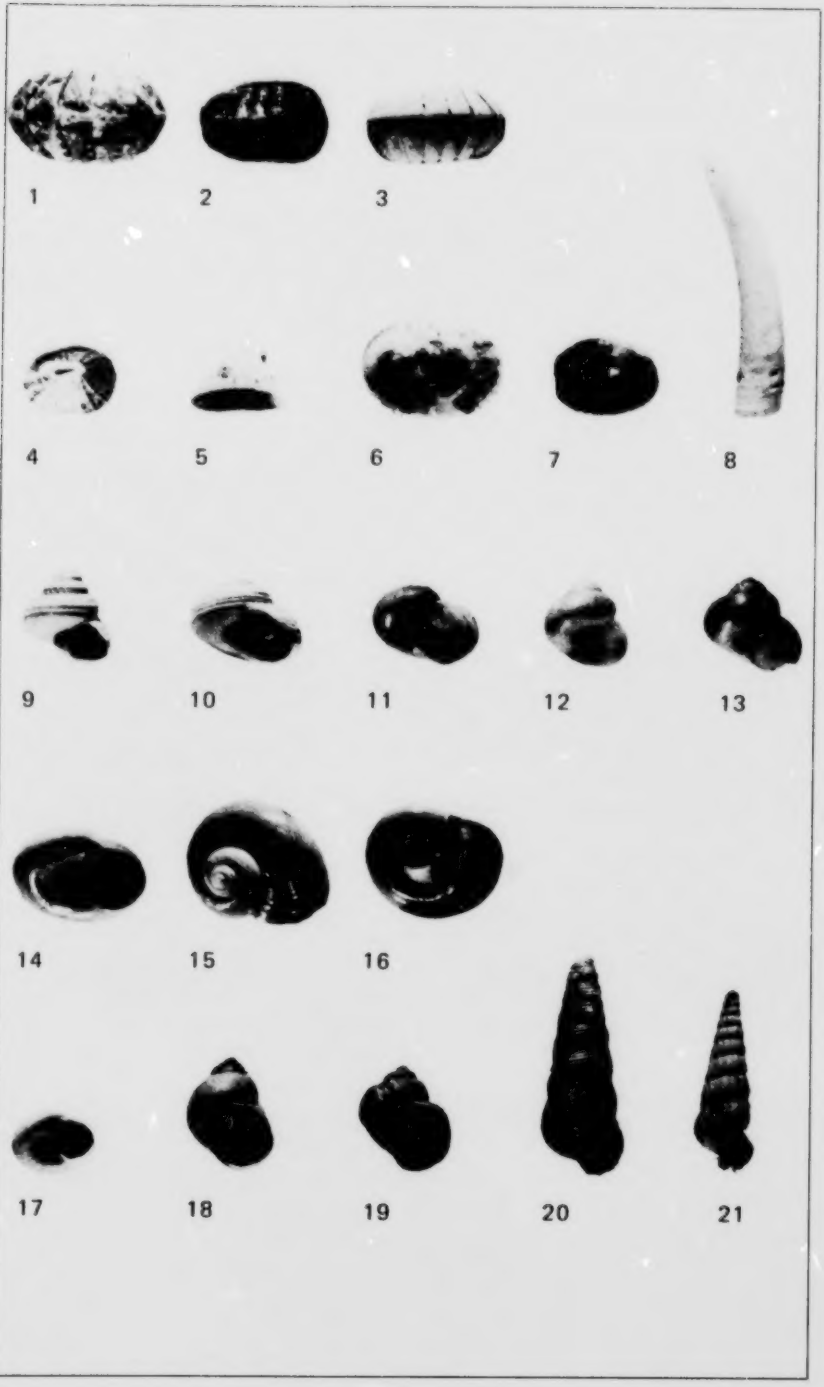
My work was supported by a contract from the National Museum of Natural Sciences, National Museums of Canada. Dr. A.H. Clarke, Curator of Molluscs, made the museum's collection available and devoted much time to my guidance. I am extremely grateful for his help and encouragement.

Thanks are due to the following for their generosity in lending specimens or allowing me access to their collections: Dr. J. Rosewater, Smithsonian Institution, Washington; Dr. N. Tebble, British Museum, London; Dr. H. Lemche, Universitetets Zoologiske Museum, Copenhagen; Dr. K. Boss, Museum of Comparative Zoology, Harvard University; Dr. R. Tucker Abbott, Academy of Natural Sciences, Philadelphia; Mr. V. Conde, Redpath Museum, McGill University; Dr. W.K. Emerson and Mr. W. Old, American Museum of Natural History, New York; and the Geological Survey of Canada, Ottawa.

I am indebted to the translators in the Foreign Languages Division, Bureau for Translations, Department of the Secretary of State, and to the staff at the National Museums for their support.

I also thank my husband, Dr. A.H. Macpherson, for his criticism of the manuscript.

Plate I



Lepidochitonidae

TONICELLA Carpenter, 1873
Type species (by original designation):
Chiton marmoreus Fabricios

TONICELLA MARMOREA (Fabricius)
Plate I, fig. 1. Map 2.

Chiton marmoreus Fabricius, 1780: 420. Type locality: probably Greenland.

Chiton laevigatus Fleming, 1828: 113, pl. 7 (not seen). For other synonyms see Yakovleva (1965: 57).

Description of specimens

The animal with its 'armour' is oblong-ovate and up to about 25 mm long. The valves of most specimens vary in colour from dull pale chestnut to bright reddish chestnut. Others are pinkish, yellowish, or brown. The surface of the valves is covered with a 'tortoise-shell' pattern of white zigzags and spots of solid colour; either the white or the darker colour may predominate. The posterior edge of each valve bears alternating unequal-sized white and coloured spots. On the surfaces of the valves are growth lines and microscopic granules. The edge of the girdle is covered with short and extremely fine bristles.

This species is recognized mainly by the pattern and colour of the valves and by the bristles on the girdle.

Plate I (all actual size)

Figure

1
TONICELLA MARMOREA
(Fabricius) NMC 35543,
Belcher Islands, N.W.T., 5

2
TONICELLA RUBRA
(Linnaeus) NMC 38764,
Malpeque Bay, P.E.I., 7

3
LOPHYROCHITON ALBUS
(Linnaeus) NMC 36357,
Foxe Basin, N.W.T., 7

4
PUNCTURELLA NOACHINA
(Linnaeus) NMC 35712,
Frobisher Bay, N.W.T., 10

5
PUNCTURELLA NOACHINA
(Linnaeus) NMC 36196,
Foxe Basin, N.W.T., 10

6
ACMAEA TESTUDINALIS
(Müller) NMC 35981,
Cape Fullerton, N.W.T., 13

7
LEPETA CAECA
(Müller) NMC 35570,
Hudson Bay, N.W.T., 15

8
SIPHONODENTALIUM LOBATUM
(Sowerby) NMC 38526,
Cape Parry, N.W.T., 9

9
MARGARITES COSTALIS
(Gould) NMC 35455,
Diana Bay, N.W.T., 16

10
MARGARITES GROENLANDICUS
(Gmelin) NMC 35470, Belcher Islands, N.W.T., 18

11
MARGARITES HELICINUS
(Phipps) NMC 182,
Nottingham Island, N.W.T., 20

12
MARGARITES OLIVACEUS
(Brown) NMC 24003,
Foxe Basin, N.W.T., 21

13
MARGARITES OLIVACEUS
(Brown) USNM 363551, Etah, Greenland (type specimen of *MARGARITES GROSVENORI* Dall), 21

14, 15, 16
MARGARITES UMBILICALIS
(Broderip and Sowerby) NMC 24001,
Foxe Basin, N.W.T., 23

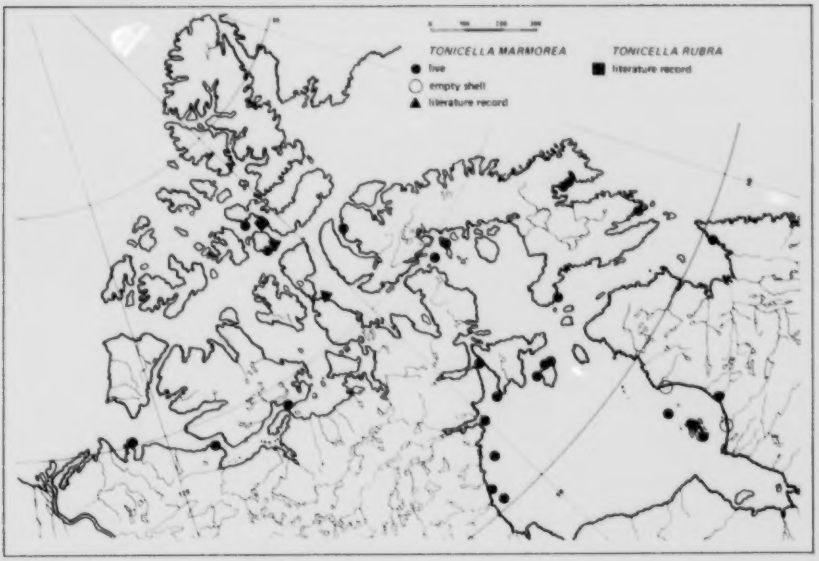
17
SOLARIELLA OBSCURA
(Couthouy) NMC 36167,
Franklin Bay, N.W.T., 25

18
LACUNA cf. *GLACIALIS*
Möller NMC 35652,
Frobisher Bay, N.W.T., 29

19
LITTORINA SAXATILIS
(Olivi) NMC 11224,
Chesterfield Inlet, N.W.T., 32

20
TACHYRHYNCHUS EROSUS
(Couthouy) NMC 131,
Hudson Strait, N.W.T., 38

21
TACHYRHYNCHUS RETICULATUS
(Mighels and Adams) NMC 36560,
Chesterfield Inlet, N.W.T., 40



Map 2

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (5); Ungava Bay (3); Hudson Bay east—Great Whale River (1), Belcher Islands (ca. 40), Richmond Gulf (1), Hopewell Sound (1), off Sleeper Islands (4); Evans Strait (17); Fisher Strait (12); Hudson Bay west—near Eskimo Point (1), off Term Point (2), Chesterfield Inlet (2); Roes Welcome Sound (5).

Northeast region:
Frobisher Bay—Countess of Warwick Sound (1); Cumberland Sound—north coast (2); Hudson Strait—Cape Dorset (1); Foxe Basin—north (2); Admiralty Inlet—Arctic Bay (5).

North region:
Barrow Strait—Resolute Bay (9); Penny Strait (1).

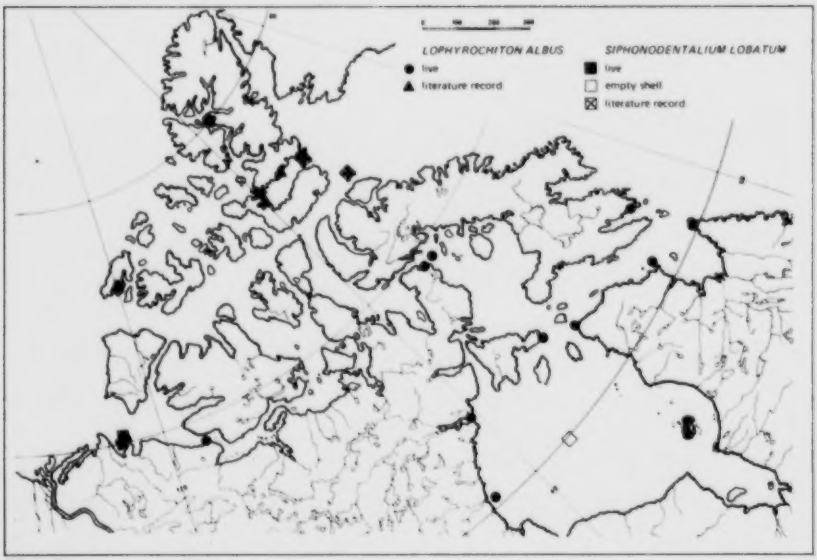
Northwest region:
Dease Strait (1); Amundsen Gulf—near Cape Parry (7); Dolphin and Union Strait (1).

Specimens were collected alive on rock at depths of from 5 to 90-95 m.

Canadian Arctic literature records

Hudson Strait (Halkett 1898: 80); Richmond Gulf, Hudson Bay* (Whiteaves 1901: 154); Cumberland Sound (Dall 1879: 146); Port Kennedy [Gulf of Boothia] (Walker 1862: 71); Arctic Bay, Baffin Island* (Ellis 1960: 40); Barrow Strait (Sutherland 1852: cci, as *Chiton laevigata*); Dolphin and Union Strait* (Dall 1919a: 16A).

Also recorded from Massachusetts, eastern Canada (Bousfield 1960); West Greenland, Great Britain, Scandinavia, Svalbard, White Sea to Bering Sea, Sea of Japan, and Aleutians at depths of from 0 to 200 m (Yakovleva 1965).



Map 3

TONICELLA RUBRA (Linnaeus)
Plate I, fig. 2. Map 2.

Chiton ruber Linnaeus, 1767: 1107.
Type locality: "Oceano Septentrionali."
Yakovleva (1965: 59) gives a number of synonyms.

This species, recorded by Reeve (1855: 396) probably from west of Devon Island, is recognized mainly by the tiny calcareous scales on the girdle and the reddish valves. It is known from Connecticut to eastern Canada (Bousfield 1960); West Greenland, Iceland, Great Britain, Norway, Barents Sea, and White Sea, from depths of 0 to 300 m (Yakovleva 1965).

Ischnochitonidae

LOPHYROCHITON Yakovleva, 1952
Type species (by monotypy):
Chiton albus Linnaeus

LOPHYROCHITON ALBUS (Linnaeus)
Plate I, fig. 3. Map 3.

Chiton albus Linnaeus, 1767: 1107.
Type locality: Iceland.
For synonyms, see Yakovleva (1965: 100).

Description of specimens

The animal is a rather elongate oblong, up to about 14 mm long. Most specimens have pure white valves, but a few are shaded with pale yellow orange on parts of the

valves and girdle. Each valve has a microscopic sculpture of growth lines and fine granules. The girdle is closely set with transparent calcareous scales and is edged with delicate calcareous spicules.

This species is recognized by the pale valves and the calcareous scales and spicules on the girdle.

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (5), near Cape Hopes Advance (1), near Digges Island (1); Hudson Bay east—Belcher Islands (2); Evans Strait—south of Seahorse Point (1); Hudson Bay west—between Churchill and Eskimo Point (1), Chesterfield Inlet (1).

Northeast region:
Frobisher Bay—Countess of Warwick Sound (1); Foxe Basin—north (2).

Northwest region:
Dolphin and Union Strait (1).

Specimens were collected alive on rock and mud at depths of from 19 to 128 m.

Canadian Arctic literature records

West of Devon Island (Reeve 1855: 396); Jones Sound (Grieg 1909: 21); entrance of Jones Sound (Thorson 1951: 11); Dolphin and Union Strait* (Dall 1919a: 16A).

Also recorded from Connecticut to eastern Canada (Bousfield 1960); East Greenland, Great Britain, Scandinavia, Svalbard, White Sea to Bering Sea, Sea of Japan, Aleutians and Pacific North America, from depths of 0 to 600 m (Yakovleva 1965).

Siphonodentaliidae

SIPHONODENTALIUM M. Sars, 1859
Type species (by monotypy):
Dentalium vitreum M. Sars (*non* Gmelin)
[= *Dentalium lobatum Sowerby*]

SIPHONODENTALIUM LOBATUM (Sowerby)
Plate I, fig. 8. Map 3.

Dentalium vitreum M. Sars, 1851: 178;
non Gmelin, 1788.

[*Dentalium lobatum* Sowerby], 1860:
100, pl. 225: 44.
Type locality: not specified.

Description of specimens

The shell is thin, small (largest specimen is 23 mm long), white, almost transluscent, smooth, and very shiny. At the apex are 6 lobes with rounded interspaces. Growth lines are crowded and very fine.

The shell of this species is differentiated from that of other tusk shells by its lobed apex and its lack of prominent sculpture.

Origin of specimens

Southeast region:
Hudson Bay – 59°57.5'N, 86°02.0'W (1).

Northwest region:
Amundsen Gulf–near Cape Parry (3); Franklin Bay (5).

North region:
Crozier Channel–Mould Bay (8); Eureka Sound–Slidre Fiord (3).

Specimens were collected alive in mud at depths of from 20 to about 192 m.

Canadian Arctic literature records

Off Lancaster Sound and near mouth of Jones Sound (Thorson 1951: 10, as *Siphonodentalium vitreum).*

Also recorded from New England, West Greenland, East Greenland, Iceland, Jan Mayen, Svalbard, Barents Sea, Siberian Ice Sea, and Portugal (Thorson 1951); also Cape Hatteras, and North Canadian Basin, from depths of 27 to 3316 m (Clarke 1963).

Scissurellidae

SCISSURELLA d'Orbigny, 1824
Type species (by subsequent designation, Gray, 1847):
Scissurella laevigata d'Orbigny

SCISSURELLA CRISPATA Fleming
Plate II, fig. 2. Map 4.

Scissurella crispata Fleming,
1832: 385, pl. 6: 3.
Type locality: "Isle of Noss, Zetland" [Shetland Islands].

Description of specimen

The shell is thin, white, and about 2 mm high by 2.5 mm in diameter. There are about 3½ rapidly enlarging whorls with deep sutures and with a rather flat apex having a slightly depressed tip. There are numerous sharp, curved, vertical ribs. Around the shoulders of the last 2 whorls, there is a sharp-sided canal, terminating in a short open slit at the aperture. The long umbilicus is bordered on one side by a high, sharp, inner lip. The wide aperture bears a thin, round, transparent, multispiralled operculum.

The shell of this species is recognized by the curved axial sculpture, by the canal at the shoulder, and by the slit in the outer lip.

Origin of specimen

Northeast region:
Frobisher Bay—near settlement (1).
The specimen was found alive at a depth of about 40 m.

Canadian Arctic literature records

Arctic Ocean, north of Borden Island, N.W.T. (Wagner 1964: 11).

Also recorded from New England, Labrador, West Greenland, East Greenland, Hebrides, Norway, and Svalbard (Thorson 1944); Arctic Ocean, off Franz Joseph Islands, and New Siberian Islands (Gorbunov 1946). Depths from 8 m (Norway) to 2020 m (off France) (Thorson 1944).

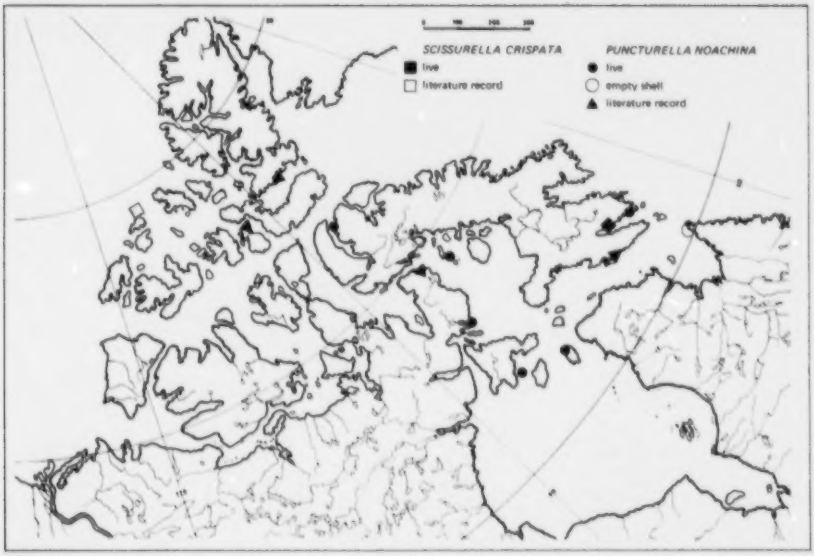
Fissurellidae

PUNCTURELLA Lowe, 1827
Type species (by monotypy):
Patella noachina Linnaeus

PUNCTURELLA NOACHINA (Linnaeus)
Plate I, figs. 4, 5. Map 4.

Patella noachina Linnaeus, 1771: 551.
Type locality: Restricted by Farfante (1947: 140) to Drobak, Norway.

Cemoria princeps Mighels and A. Adams, 1842: 42, pl. 4: 9.



Map 4

For a complete list of synonyms see Farfante (1947: 138). She does not believe that *Cemoria cognata* Gould or other antarctic species are conspecific with *P. noachina*, nor does she accept records of *P. noachina* from the Antarctic.

Description of specimens

The shell is thin, small (largest specimen is 10 mm long), and dingy white. It is limpet-shaped (the height is about ¾ of the length) and is laterally compressed. The apex is turned forward, and immediately behind it is a narrow fissure leading to a narrow, convex, internal septum. About 25 low and rounded radiating ribs, varying somewhat in width, height, and distance apart, are irregularly interspaced with lower thinner ribs near the base. Concentric growth lines cross the ribs and, in places, cut into them (especially near the base). The surfaces of some specimens appear beaded. Radiating lines of very tiny holes are visible on the shiny interior of the shell of a few specimens. There is a thin, pale tan periostracum.

The shell is distinguished from that of other species of *Puncturella* by its lateral compression and by the relatively small number of ribs.

Origin of specimens

Southeast region:
Hudson Strait—Port Burwell (1); Hudson Bay east—north of Mansel Island (1); Fisher Strait (1).

Northeast region:
Frobisher Bay—Countess of Warwick Sound (1); Foxe Channel—near Cape Martineau (1); Foxe Basin—north (10); Admiralty Inlet—Arctic Bay (1).

Specimens were collected alive on mud and rock in hauls from depths of 18-40 and 73-91 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait* (Dall 1924*a*: 34A, as *Puncturella princeps*); Lake Harbour, Baffin Island (Oughton 1940: 3, as *Puncturella* probably *princeps*); Igloolik (Ellis 1960: 40); southeast Melville Peninsula* (Farfante 1947: 141); west of Devon Island (Reeve 1855: 395, as *Cemoria cognata*) [probably this species]; Jones Sound (Grieg 1909: 22).

Also recorded from Cape Cod to Labrador, West Greenland, East Greenland, Scotland to Franz Joseph Islands, Norway south to Spain (Farfante 1947); Aleutian and Shumagin Islands, Point Barrow and south of Juneau, Alaska (MacGinitie 1959). Depths from 9 to 2212 m (Clarke 1962).

Acmaeidae

ACMAEA Eschscholtz, 1833
Type species (by subsequent designation, Dall, 1871):
Acmaea mitra Eschscholtz

ACMAEA RUBELLA (Fabricius)
Plate II, figs. 1a, b. Map 5.

Patella rubella Fabricius, 1780: 386.
Type locality: probably Greenland.

Description of specimens

The shell is a thin cone, very small (up to 6 mm long), and pale brownish pink with a white underside. Concentric growth lines are the only sculpture. The oval aperture has a margin of thinner material.

The shell of this species is recognized by the colour, the small size, and the lack of radiating lines.

Origin of specimens

Northeast region:
Frobisher Bay–Countess of Warwick Sound (1); Foxe Basin–north (3); Admiralty Inlet–Arctic Bay (4).

North region:
Barrow Strait–near Resolute Bay (1); Wilkins Strait (10).

Specimens were collected alive on mud from depths of 8 to 22 m.

Canadian Arctic literature records

"Upper Savage Island," Hudson Strait* (Whiteaves 1885: 58DD); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 332); Igloolik and Arctic Bay*, Baffin Island (Ellis 1960: 40); Assistance Bay [Barrow Strait] (Sutherland 1852: cci); north shore Jones Sound (Grieg 1909: 22).

Also recorded from Nova Scotia and Labrador (Whiteaves 1901); West Greenland, East Greenland, Iceland, Jan Mayen, Norway, Svalbard, Murman Coast, and Novaya Zemlya, from 4 (East Greenland) to 565 m (off Norway) (Thorson 1944).

Map 5

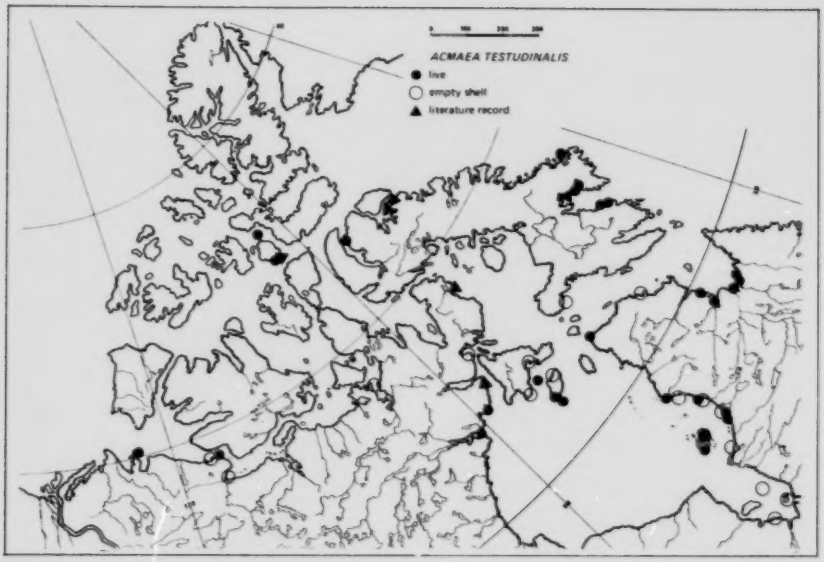
ACMAEA TESTUDINALIS (Müller)
Plate I, fig. 6. Map 6.

Patella testudinaria Müller, 1776: 237;
non Linnaeus, 1758.
Patella testudinalis Müller, 1776: 237.
Type locality: "Daniae et Norvegiae."

For other possible synonyms see Dautzenburg and Fischer (1912: 295).

Description of specimens

The shell is moderately thick and medium-sized (largest specimen is 31 mm long, 22.5 mm wide, and 11.5 mm high). It is a cone of very variable height with a blunt apex slightly turned forward, just in front of centre. There is a variable pattern, which most often consists of broken radial lines, and rarely of concentric rings of solid colour. Some shells show a combination of these features. The colour varies from dark brown to a light reddish brown, on a white background. The pattern is visible inside on at least part of the shell in most specimens, usually at the base, the central portion being brown: in a few specimens it looks bluish. The underside is predominantly white, except on some specimens from Hudson Bay, in which it is blue. The sharp and distinct lines of growth are crossed by very fine radial lines. The sharp margin is of thinner material than the rest of the shell.
The shell of this species is distinguished from that of other northern limpets by its pattern and by the appearance of the incised lines on its surface.



Map 6

Origin of specimens

Southeast region:
Ungava Bay—east (25), south (2); Hudson Strait—Wakeham Bay (2), Digges Islands (3); James Bay—Charlton Island (10), between Albany and Moose rivers (1), South Twin Island (6); Hudson Bay east—Great Whale River (6), Belcher Islands (ca. 95), between Great Whale and Richmond Gulf (4), off Richmond Gulf (6), northern Nastapoka Islands (9), Hopewell Sound (3); Hudson Bay north—south of Coats Island (6); Evans Strait (12); Fisher Strait (10); Hudson Bay west—Chesterfield Inlet (10); Roes Welcome Sound—Cape Fullerton (30); Repulse Bay (1).

Northeast region:
Hudson Strait—Alareak Island (1); Cumberland Sound—north coast (2), Pangnirtung Fiord (8), south coast (1); Davis Strait—Padloping Island (5); Admiralty Inlet—Arctic Bay (7).

North region:
Barrow Strait—off Resolute Bay (10); Wellington Channel (2).

Northwest region:
Coronation Gulf (1); Chantrey Inlet (1); Dolphin and Union Strait (6); Amundsen Gulf—Cape Parry (15).

Specimens were collected alive on mud, sand, and rock from shore to a depth of 40 m.

Canadian Arctic literature records

Near Fort Chimo, Ungava Bay (Dall 1886: 206); northeast Hudson Bay and James Bay (Pelletier *et al.* 1968: 574, and 575, as *"Acmaea emydia"*); Charlton* and Carey Islands, James Bay (Richards 1936: 539); Chesterfield Inlet, Roes Welcome Sound, Repulse Bay, west coast of Foxe Basin, and Eclipse Sound, Baffin Island (Laurson 1946: 53-56); Southampton Island, N.W.T. (Brooks 1935: 2); Fullerton, Hudson Bay* (Dall 1924*a*: 33A); Cumberland Sound (Pfeffer 1886*a*: 44); Pangnirtung, Baffin Island (Oughton 1940: 5); Cumberland Sound (Dall 1879: 146) north and south coasts of Cumberland Sound* (Ellis 1955: 228); Assistance Bay

[Barrow Strait] (Sutherland 1852: cci); west of Devon Island (Reeve 1855: 395); Dolphin and Union Strait* (Dall 1919a: 14A-17A, as *"Acmaea emydia"*).

Also recorded from Long Island Sound to Labrador (Whiteaves 1901); West Greenland (Thorson 1951); Norwegian Sea, British Isles, Soviet Arctic, Bering Sea, and Alaska (Odhner 1912). Depths from shore to 100 m (Barents Sea) (Filatova and Zatsepin 1948).

Lepetidae

LEPETA Gray, 1842
Type species (by subsequent designation, Gray, 1847):
Patella caeca Müller

LEPETA CAECA (Müller)
Plate I, fig. 7. Map 7.

Patella caeca Müller, 1776: 237.
Type locality: "Daniae et Norvegiae."
Patella candida Couthouy, 1838: 86, pl. 3: 17.
Patella cerea Möller, 1842: 16.

Description of specimens

The shell is limpet-shaped, oval, and up to 18 mm long. It is straw-coloured on top, and white or rarely bluish brown on the underside. The height is variable and in some specimens the shell is slightly concave in front of the apex—behind the apex it is always convex. Fine and numerous, slightly elevated growth lines are crossed by much higher radiating ribs to give the surface its checkered and granulated appearance. The material of the margin is rather thinner than that of the rest of the shell. There is a flaky and, in some specimens, reticulate, light brown periostracum.

The shell of this species is recognized by the granular and cancellate appearance of the surface.

Origin of specimens

Southeast region:
Hudson Strait—off Cape William Smith (2); Ungava Bay—northeast (23); Hudson Bay east—Belcher Islands (13), Richmond Gulf (6), Hopewell Sound and south (19); Evans Strait (19); Fisher Strait (4); Hudson Bay west—south of Churchill (5), off Churchill (3), between Churchill and Chesterfield Inlet (2); Roes Welcome Sound (1); Repulse Bay (12); Frozen Strait (1).

Northeast region:
Frobisher Bay—near settlement (2); Foxe Basin—north (9); Fury and Hecla Strait (18); Prince Regent Inlet—Creswell Bay (3); Admiralty Inlet—Arctic Bay (16).

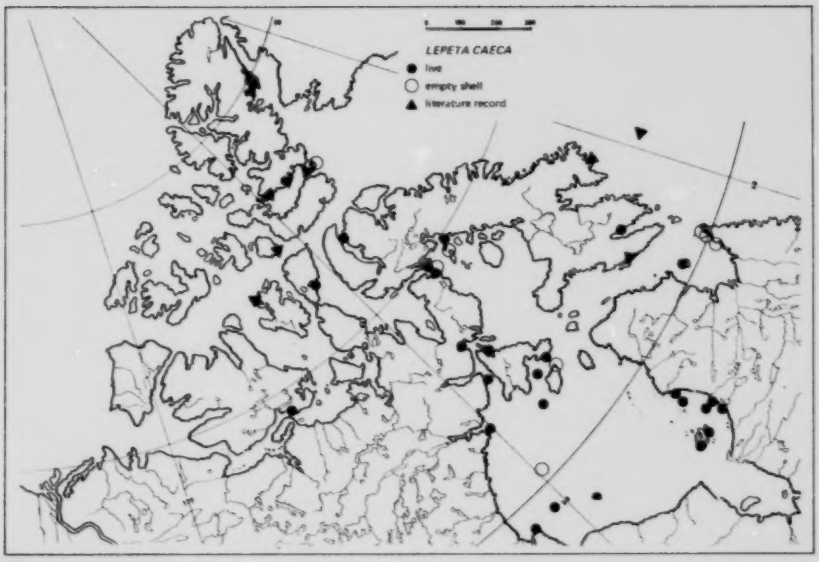
North region:
Jones Sound—Coburg Island (2).

Northwest region:
Dease Strait (2).

Specimens were collected alive on mud, sand, gravel, and rock at depths of from 10 to 143 m.

Canadian Arctic literature records

Lake Harbour, Baffin Island (Oughton 1940: 3); Exeter Sound, Baffin Island, and mouth of Jones Sound (Thorson 1951: 15); west Davis Strait (Allen 1965: 986); Arctic Bay, Baffin Island* (Ellis 1960: 40); Cape Eden [northwest Prince of Wales Island] (Reeve 1855: 395, as *Patella cerea*); Assistance Bay [Barrow Strait] (Sutherland 1852: cci, as *Patella cerea*); Jones Sound (Grieg 1909: 22); Franklin Pierce Bay, Cape Frazer, and Richardson Bay [northeast Ellesmere Island] (Smith 1877: 139 and 1878: 229).



Map 7

Also recorded from [?] West Indies, New England to Labrador, West Greenland, East Greenland, British Isles, Azores, Norway, Svalbard, and Soviet Arctic to Japan (Thorson 1944); Point Barrow, Alaska to Aleutians (MacGinitie 1959). Depths from 3 (Iceland) to 1300 m (Azores) (Thorson 1944).

Trochidae

MARGARITES Gray, 1847
Type species (by original designation):
Turbo helicinus Phipps, 1774

MARGARITES COSTALIS (Gould)
Plate I, fig. 9. Map 8.

Margarita striata Broderip and Sowerby, 1829: 371;
non Leach, 1819.

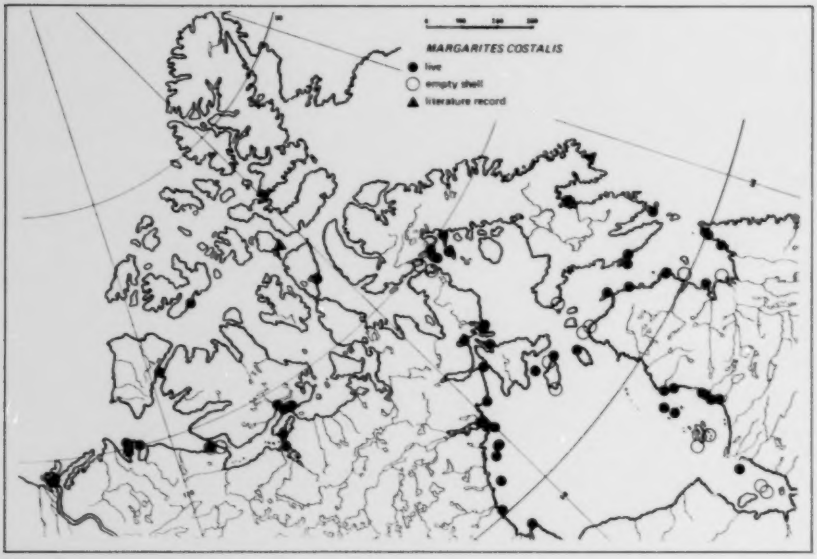
Turbo cinereus Couthouy, 1838: 99,
pl. 3: 9; *non* Born, 1778.

Trochus costalis Gould (ex Lovén MS), 1841: 252,
described in synonymy.

Margarita sordida Hancock, 1846: 324.
Type locality: Massachusetts Bay.

Trochus polaris (*Margarita*) (Beck) Philippi, 1846: 249,
pl. 37: 9; *nomen oblitum.*

Trochus corneus Kiener, 1873: 70,
pl. 19: 2 (*Turbo*).



Map 8

Description of specimens

The shell is moderately thin, of medium size (up to 25 mm in diameter and 25 mm high), and a dull grey or yellowish white. Parts of the shell are iridescent blue when wet. There are 6 to 8 whorls and a nearly flat apex. In most specimens there are fine, elevated growth lines, especially distinct on the early whorls. Spiral ribs vary in height, and in a few specimens are alternately weak and strong. In almost all specimens, the spiral ribs continue on the underside of the body whorl, but are lower there and closer. On most specimens, the low spiral ribs around the deep umbilicus are stronger and wider; they are absent only from those specimens that are smooth toward the base of the whorl. A groove extends beside the umbilicus along the inner lip, which is sharp and high. The aperture is round but for an angle near the base. The operculum is large and clearly spiralled.

Higher, straighter-sided whorls and elevated growth lines on the early whorls distinguish the shell of this species from those of other large arctic *Margarites*.

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (15); Diana Bay (6), Wakeham Bay (1), King George Sound (4), Charles Island (1), Digges Islands (9); Ungava Bay—northeast coast (12), off Koksoak River mouth (2), off Payne Bay (2); James Bay—between Charlton Island and Akimiski Island (1), off South Twin Island (2), off northeast coast (7); Hudson Bay east—Belcher Islands (9), Richmond Gulf (8), Richmond Gulf to Nastapoka River (6), Sleeper Islands and north (6), near Port Harrison (10), north of Mansel Island (3); Hudson Bay north—south of Coats Island (1); Evans Strait (9); Fisher Strait (1); Hudson Bay west—between Churchill and Eskimo Point (5), near Term Point (2), off and at Chesterfield Inlet (5); Roes Welcome Sound (4); Repulse Bay (14); Frozen Strait (3).

North region:
Viscount Melville Sound–Winter Harbour (2).

Northeast region:
Hudson Strait–Cape Dorset (2), Big Island (2), Lake Harbour (7); Frobisher Bay–mouth (1), Foxe Channel–off Melville Peninsula (24); Foxe Basin–north (ca. 90); Fury and Hecla Strait (6); Prince Regent Inlet–Creswell Bay (5).

Northwest region:
Dease Strait (16); Bathurst Inlet (14); Melville Sound (5); Dolphin and Union Strait (25); Darnley Bay (2); Amundsen Gulf–Cape Parry (30); Franklin Bay (1); Prince of Wales Strait (5); Mackenzie Bay (ca. 50).

Specimens were collected alive on clay, mud, sand, and rock at depths from 0 to 95-130 m.

Canadian Arctic literature records

Port Burwell and "Upper Savage Island," Hudson Strait* (Whiteaves 1885: 58DD, 60DD, as *Margarita striata*); Hudson Strait (Halkett 1898: 80, as *Margarites cinerea*); Port Burwell, Hudson Strait, Fullerton, Hudson Bay, and Winter Harbour, Melville Island* (Dall 1924 and 1924*a*: 31A, 33A, 34A, 35A, as *Margarites striatus* and *Margarites cinereus*); southwest Hudson Bay (Pelletier *et al.* 1968: 575); Lake Harbour, Baffin Island (Oughton 1940: 3, as *Margarites cinerea*); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 324, as *Margarita sordida*); Exeter Sound, Baffin Island, and off Jones Sound (Thorson 1951: 19, as *Margarita cinerea*); Assistance Bay [Barrow Strait] (Sutherland 1852: cci, as *Turbo corneus*); Hell Gate [southwest Ellesmere Island] (Grieg 1909: 25, as *Margarita striata*); Melville Island* and mouth of Mackenzie River* (Dall 1919*a*: 14A, 15A, 16A, as *Margarites sordidus*).

Also recorded from Mexico (Odhner 1912); New England to Labrador, West Greenland, East Greenland, Hebrides, Ireland, and Norway (Thorson 1951); Svalbard and Franz Joseph Islands, Point Barrow, Alaska (MacGinitie 1959). Depths to 660 m (west of Norway) (Thorson 1944).

MARGARITES GROENLANDICUS (Gmelin)

Plate I, fig. 10. Map 9.

Trochus groenlandicus umbilicalus Chemnitz, 1781: 108, pl. 171: 1671 (work not binomial).

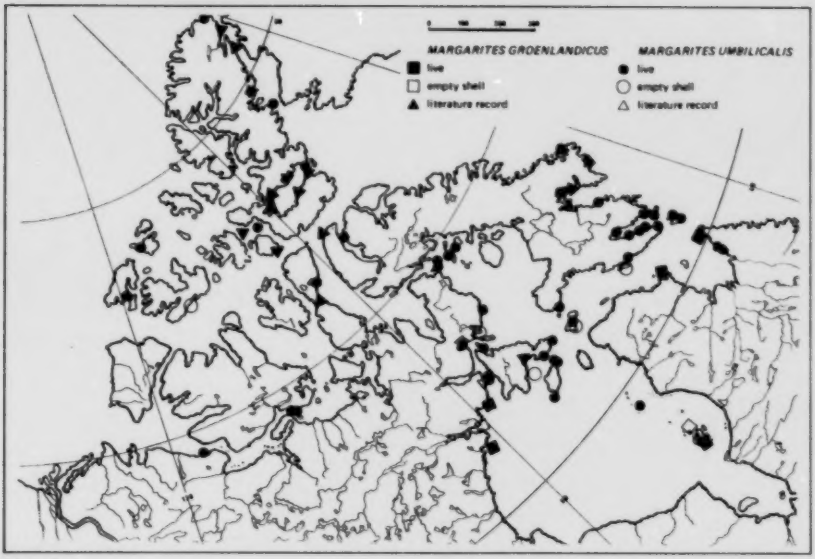
Trochus groenlandicus Gmelin, 1791: 3574.

Type locality: Greenland.

Margarita undulata Sowerby, 1838: 26 (not seen).

Description of specimens

The shell is moderately thin, medium-sized (largest specimen is 16 mm in diameter and 11 mm high), and dingy white or pinkish. There are 6 to 7 rapidly enlarging whorls and a pointed apex. The early whorls are quite depressed, but the body whorl has higher sides. The high, rounded, and numerous spiral ribs are interspersed on the body whorl with weaker ribs. Toward the base of the shell, in most



Map 9

specimens, the ribs become less distinct and closer together. Four shells display indistinct folds at the suture above the body whorl, but none have the characteristic strong folds found on specimens from Gaspé. The deep and round umbilicus is partly covered by the sharp inner lip. The aperture has a rather elliptical shape: the outer lip rises near the central axis and descends obliquely, forming an angle at the outer edge. The inner lip is everted at the base. The operculum is thin and spiralled.

The shell of this species is distinguished from that of *M. costalis* by its depressed early whorls and lack of elevated growth lines. It is distinguished from sculptured shells of *M. umbilicalis* by the higher body whorl, the thicker shell, and the more obscured, smaller umbilicus.

Origin of specimens

Southeast region:
Hudson Strait—Port Burwell (2), Diana Bay (1); Hudson Bay east—Belcher Islands (4), Sleeper Islands (1); Hudson Bay west—off Rankin Inlet (1), Chesterfield Inlet (1); Roes Welcome Sound—Cape Fullerton (1).

Specimens were collected alive on mud and rock at depths of from 12 to 90-115 m.

Canadian Arctic literature records

Roes Welcome Sound, Repulse Bay (Laurson 1946: 55, 56). It is unlikely that the specimens referred to by Sutherland (1852: cci, as *Margarita undulata*) are from Barrow Strait, if identified correctly.

Also recorded from southeastern Canada and Labrador (Whiteaves 1901); West Greenland (Thorson 1944); Svalbard, northern Norway, and Soviet Arctic coast as far east as Novaya Zemlya to 512 m (Galkin 1955).

MARGARITES HELICINUS (Phipps)

Plate I, fig. 11, Map 10.

Turbo helicinus Phipps, 1774: 198.
Type locality: "Spitzbergen."

Trochus helicinus Fabricius, 1780: 393.

Margarita arctica Leach, 1819: 61.

Margarita campanulata "Morse," Packard, 1867: 284, pl. 7: 15, 15a.

For other possible synonyms see Dautzenburg and Fischer (1912: 270) and Galkin (1955: 75).

Description of specimens

The shell is very thin and small (largest specimen is 11 mm in diameter and 6 mm high). More than half of the specimens are straw coloured, a few are reddish brown, and the rest are a darker, purplish brown. All are shiny and iridescent when worn or wet. There are about 4½ whorls, eniarging very rapidly from a blunt apex. The proportion of height to width is variable. Growth lines are barely visible and only the base of the body whorl bears microscopic spiral threads. The umbilicus is unadorned and deep, its edge being covered by the raised inner lip. The aperture is round or slightly elliptical in shells with a vertically compressed body whorl. The operculum is thin and spiralled.

The shell of this species is recognized by its smoothness and few whorls, and is distinguished from the young of *M. umbilicalis* by the blunt apex and small umbilicus.

Origin of specimens

Southeast region:
Hudson Strait—off Port Burwell (13), near Wakeham Bay (11), King George Sound (1), Sugluk (4), Nottingham Island (17); Ungava Bay—Adlorilik (1), Gyrfalcon Islands (6), Nuvuk Harbour (9); Evans Strait (5); Fisher Strait (1); Hudson Bay west—Whale Cove (25), Chesterfield Inlet (7); Roes Welcome Sound—Cape Fullerton (14); Repulse Bay (8).

Northeast region:
Hudson Strait—near Cape Dorset (38), near Big Island (3), Lake Harbour (ca. 80), off Resolution Island (2); Frobisher Bay—Potter's Island (1), Ogac Lake (2), Becher Peninsula (ca. 55), Chase Island (5), Loks Land (6); Cumberland Sound (ca. 65), south shore (1), near Pangnirtung (5); Davis Strait—north of Loks Land (3), Padloping Island (5); Foxe Basin—north (ca. 90); Prince Regent Inlet—Creswell Bay (14); Eclipse Sound—near Pond Inlet (10).

North region:
Barrow Strait—near Resolute Bay (3); Penny Strait (5); Smith Sound—near Cape Sabine (ca. 50).

Northwest region:
Dolphin and Union Strait (15); Amundsen Gulf—Cape Parry (7).

Specimens were collected alive on mud, sand, and rock at depths of from 0 to 192 m.

Canadian Arctic literature records

Labrador Reef [Hudson Strait] (Dall 1887: 206) Port Burwell, Hudson Strait* (Whiteaves 1885: 60DD); Port Burwell, Hudson Strait* and Cape Fullerton, Hud-

Map 10

son Bay* (Dall 1924*a*: 33A, 34A); Port Burwell, Lake Harbour, and Pangnirtung (Oughton 1940: 3, 4, 5); northeast Hudson Bay (Pelletier *et al.* 1968: 575) Frobisher Bay* and Cumberland Sound* (Ellis 1955: 228); Cumberland Sound* (Dall 1879: 146); Exeter Sound, Baffin Island (Thorson 1951: 16); Igloolik* and Arctic Bay, Baffin Island (Ellis 1960: 40); Port Kennedy [Gulf of Boothia] (Walker 1852: 71, as *Margarita arctica*); Assistance Bay [Barrow Strait] (Sutherland 1852: cci, as *Margarita arctica*), Jones Sound and Rice Strait (Grieg 1909: 23) Franklin Pierce Bay [Kane Basin] (Jeffreys 1877: 240, and Smith 1878: 228); Bernard Harbour, Dolphin and Union Strait* (Dall 1919*a*: 14A and 16A, also as *Margarites albulus*).

Also recorded from Massachusetts Bay and Gulf of St. Lawrence (Bousfield 1960); West Greenland, East Greenland, Iceland, Faroe Islands, British Isles, Svalbard, Soviet Arctic to Bering Sea, Aleutians, and Sea of Okhotsk to a depth of 407 m (Norway) (Thorson 1944).

MARGARITES OLIVACEUS (Brown)

Plate I, figs. 12, 13. Map 11.

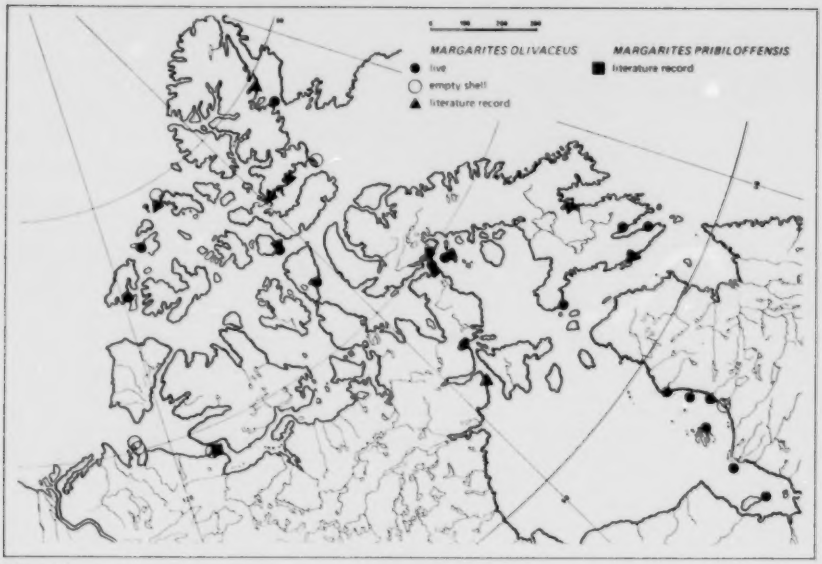
Turbo olivaceus Brown, 1827, pl. 46: 30, 31. (not seen)
Type locality: Greenock, Scotland.

Margarita argentata Gould, 1841: 256, fig. 174.

Margarita glauca Möller, 1842: 8.

Margarita harrisoni Hancock, 1846: 325, pl. 5: 4, 5.

Margarites grosvenori Dall, 1926: 59.



Map 11

Description of specimens

The shell is moderately thick and variable in size (largest specimen is 10.5 mm in diameter and 11 mm high). It is dull silver or greenish or yellowish white and iridescent when wet. There are 4½ to 5½ whorls, the first 2 being so depressed in most specimens that the apex is flat. A few specimens have a more pointed apex. The shell surface is covered with close, microscopic spiral threads, which vary in coarseness and distance apart. Growth lines are less distinct. The aperture is circular except for a slight angle at the base. The high, sharp inner lip covers up to ½ of the umbilicus. The operculum has about 8 spirals.

The shell of this species is recognized by its colour, dullness, and microscopic spiral threads.

Origin of specimens

Southeast region:
James Bay—southeast of Akimiski Island (2); Hudson Bay east—Belcher Islands (1), Richmond Gulf (1), Nastapoka Sound (7), Port Harrison (1); Repulse Bay (1).

Northeast region:
Hudson Strait—off Cape Dorset (1); Frobisher Bay—near settlement (1), Daniel's Harbour (3); Foxe Basin—north (ca. 90); Fury and Hecla Strait (2); Prince Regent Inlet—Creswell Bay (ca. 125).

North region:
Barrow Strait—near Resolute Bay (45); Jones Sound—mouth (4); Crozier Channel (1); Wilkins Strait (1); Smith Sound—Cape Sabine (1); Arctic Ocean—off Cape Isachsen (3).

Northwest region:
Dolphin and Union Strait (1); Darnley Bay (1); Amundsen Gulf—Cape Parry (1).

Specimens were collected alive on clay, mud, sand, and rock from shore level to a depth of 106 m.

Canadian Arctic literature records

Roes Welcome Sound (Laurson 1946: 55, 56); Lake Harbour, Baffin Island (Oughton 1940: 3, as *Margarites grosvenori*); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 325, as *Margarita harrisoni*); Assistance Bay [Barrow Strait] (Sutherland 1852: cci, as *Margarita glauca*); Wellington Channel (Jeffreys 1877: 238); Cape Frazer [Kane Basin] (Jeffreys 1877*b*: 492); Franklin Pierce Bay [Kane Basin] (Smith 1877: 139 and 1878: 228, as *Trochus (Margarita) glauca*); off Ellef Ringnes Island* (Dall 1924: 31A, as *Margarites argentatus*); Prince Gustav Adolph Sea* (Wagner 1964: 11, as ? *Margaritopsis* ? *grosvenori*) may be this species. Løyning (1932: 6) states that according to Grieg, the specimens referred to by him (Grieg 1909: 23) as *Margarita olivacea* are young stages of *Margarita umbilicalis*.

Also recorded from Cape Cod, eastern Canada, West Greenland, East Greenland to Hebrides, Norway, and Svalbard (Thorson 1944); Soviet Arctic to Bering Sea and to Japan Sea, west coast of America, south to Oregon (Galkin 1955). Depths to 385 m (East Greenland) (Thorson 1944).

MARGARITES PRIBILOFFENSIS Dall
Map 11.

Margarites pribiloffensis Dall, 1919: 366.
Type locality: U.S. Fish Commission station 3504, near the Pribilof Islands, Bering Sea.
See MacGinitie (1959: pl. 2: 10, pl. 8: 1) for figures.

MacGinitie (1959: 79) records this species from Bernard Harbour, Dolphin and Union Strait, N.W.T. as well as from Point Belcher and Point Barrow, Alaska to a depth of 226 m in Alaska. The shells I examined are thinner and smoother than those of *M. olivaceus*.

MARGARITES UMBILICALIS (Broderip and Sowerby)
Plate I, figs. 14, 15, 16. Map 9.

Margarites umbilicalis Broderip and Sowerby, 1829: 371.
Type locality: "in Oceano Boreali."

Some authors, such as Galkin (1955), refer to this species as a subspecies of *M. groenlandicus*.

Description of specimens

The shell is very thin, rather large (up to 24 mm in diameter and 20 mm high), pale tan, glossy, and only slightly iridescent when wet. There are 5 to 7 very rapidly enlarging whorls with deep sutures and a tiny apex. In almost all specimens the whorls are vertically flattened. More than half the shells are quite smooth, and most of the rest have spiral ribs on the early whorls. Shells that also bear ribs on the penultimate and last whorls occur in small numbers from many localities. Many shells have fine spiral threads on the base of the body whorl. The opening of the large round umbilicus is bordered in neither a groove nor a depression. The elliptical aperture has a high, sharp, inner lip. The operculum is thin and spiralled.

When ribbed, this species is best distinguished from *M. groenlandicus* by the very thin and depressed shell and large open umbilicus, and when young, from *M. helicinus* by the pointed apex and larger umbilicus.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (8), Nottingham Island (6); Ungava Bay–near Keglo Bay (3); Hudson Bay east–Belcher Islands (1), near Ottawa Islands (2); Hudson Bay north–south of Coats Island (1); Evans Strait (6); Fisher Strait (3); Roes Welcome Sound (5); Repulse Bay (13); Frozen Strait (ca. 30).

Northeast region:
Hudson Strait–off Resolution Island (1), Lake Harbour (5), Big Island (12), near Cape Dorset (3); Frobisher Bay–south side (ca. 50), north side (35), mouth (2); Davis Strait–between Frobisher Bay and Cumberland Sound (1), Padloping Island (4); Cumberland Sound–Blacklead Island (1), Ptarmigan Fiord (5); Foxe Basin–southwest (4), north (ca. 160); Prince Regent Inlet–Creswell Bay (22); Admiralty Inlet–Arctic Bay (1).

North region:
Barrow Strait–near Resolute Bay (ca. 60); Viscount Melville Sound–Winter Harbour (10); Wellington Channel (7); Crozier Channel (1); Jones Sound–Craig Harbour (4); Wilkins Strait (25); Smith Sound–Cape Sabine (2); Lincoln Sea–Alert (27).

Northwest region:
Dease Strait (9); Dolphin and Union Strait (11).

Specimens were collected alive on clay, mud, sand, gravel, and rock at depths of from 0 to 192 m.

Canadian Arctic literature records

Lake Harbour, Baffin Island (Oughton 1940: 3); northeast Hudson Bay (Pelletier *et al.* (1968: 574); Southampton Island (Brooks 1935: 2); Frobisher Bay settlement and Blacklead Island, Cumberland Sound* (Ellis 1955: 228, as *Margarites groenlandicus*); "west coast Davis Strait" [Cumberland Sound] (Hancock 1846: 324); Cumberland Sound* (Dall 1879: 146); Cumberland Sound (Pfeffer 1886*a*: 43); Melville Peninsula (Dall 1887: 206); Igloolik and Arctic Bay (Ellis 1960: 40, as *Margarita groenlandica*); Port Kennedy [Gulf of Boothia] and Cape York [Lancaster Sound] (Walker 1862: 71); Lancaster Sound (Jeffreys 1877: 237); Assistance Bay [Barrow Strait] (Sutherland 1852: cci); Northumberland Sound (Reeve 1855: 393); Winter Harbour, Melville Island* (Dall 1924: 31A); Jones Sound and Rice Strait (Grieg 1909: 24); Exeter Sound, Baffin Island (Thorson 1951: 18, as *Margarita groenlandica* 'smooth form'); Franklin Pierce Bay [Kane Basin] and Mushroom Point [Robeson Channel] (Smith 1877: 138 and 1878: 228); Discovery Bay [Kennedy Channel] (Jeffreys 1877, 1877*a*: 240); "Floeberg Beach" [Robeson Channel] (Jeffreys 1877*b*: 492); south shore Dolphin and Union Strait* (Dall 1919*a*: 14A, 16A).

Also recorded from northern Labrador (Dall 1879); northeast and northwest Greenland, Soviet Arctic (off-shore) east to Laptev Sea, to a depth of 365 m (Galkin 1955).

MARGARITES VAHLI (Möller)
Plate II, fig. 3. Map 12.

Margarites vahlii Möller, 1842: 8.
Type locality: Greenland.

Margarites johnsoni Dall, 1921*a*: 49-50;
non Arnold, 1909.

Margarites mighelsi Rehder, 1937: 115.

Description of specimens

The shell is minute (largest specimen is 4.8 mm in diameter and 4.1 mm high), white, and extremely shiny. The light iridescent nacre shines through the shell in most specimens. Five to 6 whorls have relatively shallow sutures, and the apex is flat. Except for extremely faint growth lines, there is no sculpture. The aperture is round. The thickened inner lip projects slightly over the edge of the small umbilicus. The operculum has widely separated spiral sutures.

The shell of this species is recognized by its small size, smoothness, and proportionally large number of whorls.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (12); Hudson Bay west–Chesterfield Inlet (1).

Northeast region:
Frobisher Bay (3); Foxe Basin–northwest (1); Prince Regent Inlet–Creswell Bay (5).

Specimens were collected alive on mud and rock at depths from 22-24 to 75-90 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait* (Dall 1924*a*: 34A, as *Margarites acuminatus*); Assistance Bay [Barrow Strait] (Sutherland 1852: cci). Dall (1921: 50) recorded this species from "Port Burwell, Ungava Bay, Hudson Bay" as *Margarites johnsoni*, the last locality being an error repeated by other recent authors.

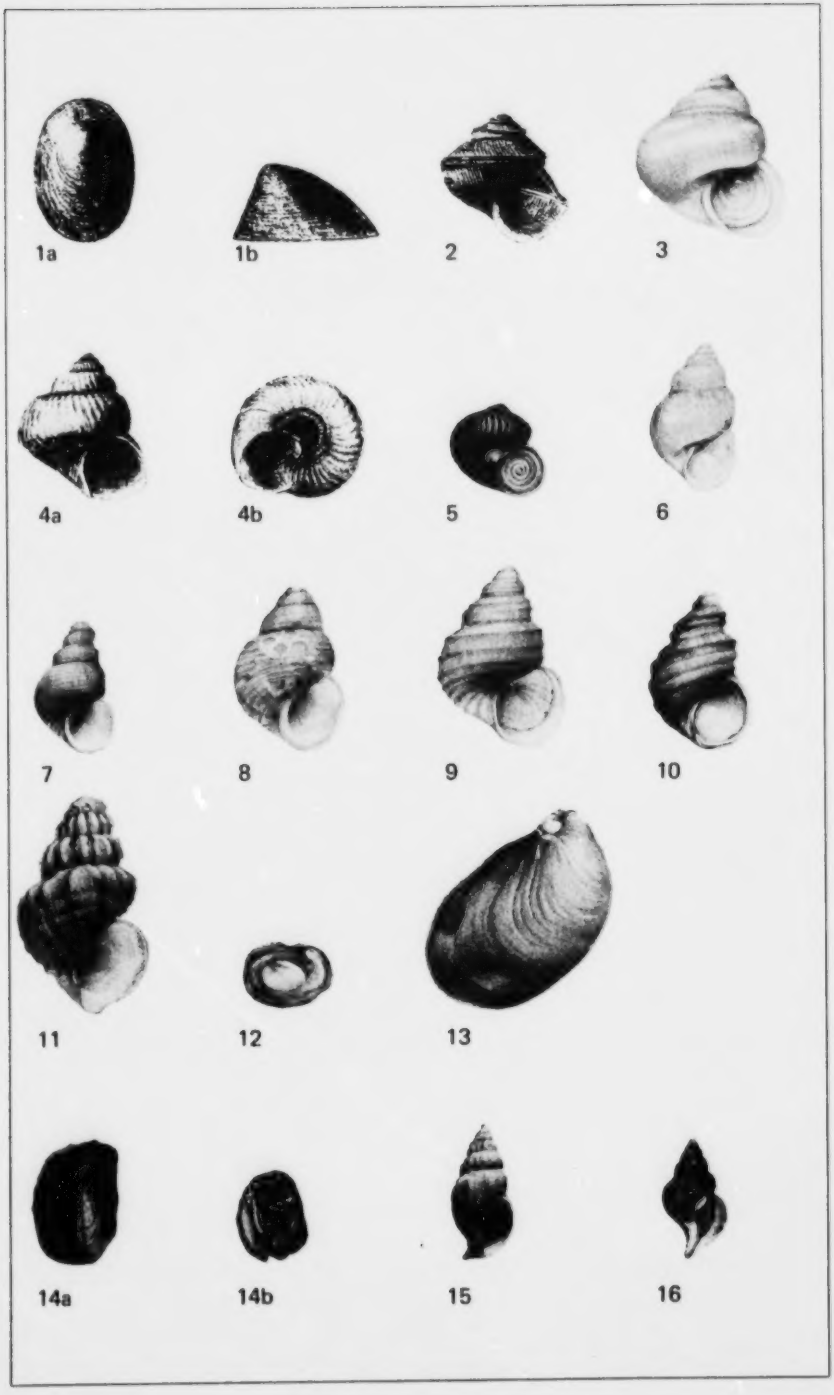
Also recorded from West Greenland, East Greenland, Svalbard, and Puget Sound (Thorson 1944); Soviet Arctic to Bering Sea and Japan Sea (Galkin 1955); Point Barrow, Alaska (MacGinitie 1959). Depths from 20 to 414 m (Galkin 1955).

SOLARIELLA Wood, 1842
Type species (by monotypy):
Solariella maculata Wood

SOLARIELLA OBSCURA (Couthouy)
Plate I, fig. 17. Map 12.

Turbo obscurus Couthouy, 1838: 100.
Type locality: Massachusetts Bay.

Plate II



Description of specimens

The shell is small (largest specimen is 7 mm in diameter and 5.5 mm high), and dull grey or dingy white. There are 4 to 5 vertically depressed whorls. Near the sutures and on the underside of the shell are low axial folds. At the edge of each whorl are 2 or more rounded spiral carinae, interspaced with weak spiral ribs and fine spiral threads, which are best seen on the body whorl. Where the longitudinal and horizontal ribs meet, there may be faint elevations. The umbilicus in its circular depression is large and deep and, in one specimen, bounded by a ridge. The aperture is circular and the inner lip is sharp. The operculum is thin and spiralled.

The more flattened whorls and larger umbilicus best distinguish the shell of this species from that of *Margarites costalis*.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (2) (worn, probably this species).

Northwest region:
Dease Strait (1) (broken, probably this species); Franklin Bay (2).

Specimens were collected alive from depths between 13 and 70-80 m.

Plate II

Figure

1a, b
ACMAEA RUBELLA
(Fabricius) from Sars, 1878, Pl. VIII:5. Norway. (X4), 12

2
SCISSURELLA CRISPATA
(Fleming) from Sars, 1878, Pl. VIII:7a. Norway. (X4), 10

3
MARGARITES VAHLI
(Möller). NMC 36681, Creswell Bay, N.W.T., (X6), 25

4a, b
SOLARIELLA VARICOSA
(Mighels and Adams) from Sars, 1878, Pl. IX:2. Norway. (X2), 28

5
MOELLERIA COSTULATA
(Möller). NMC 27381, Nastapoka Sound, Hudson Bay, (X6), 29

6
HYDROBIA MUNUTA
(Totten). NMC 19895, Carlton Island, James Bay, (X6), 34

7
CINGULA cf. *ARENARIA*
(Mighels and Adams). NMC 35942, Ungava Bay, Qué., (X3), 34

8
CINGULA CASTANEA
(Möller). NMC 36039, Arctic Bay, N.W.T., (X6), 35

9
CINGULA MOERCHI
Collin. NMC 36699, Creswell Bay, N.W.T., (X6), 36

10
ALVANIA CRUENTA
Odhner. NMC 36647, Cambridge Bay, N.W.T., (X6), 37

11
ALVANIA JANMAYENI
(Friele). NMC 36671, Creswell Bay, N.W.T., (X6), 38

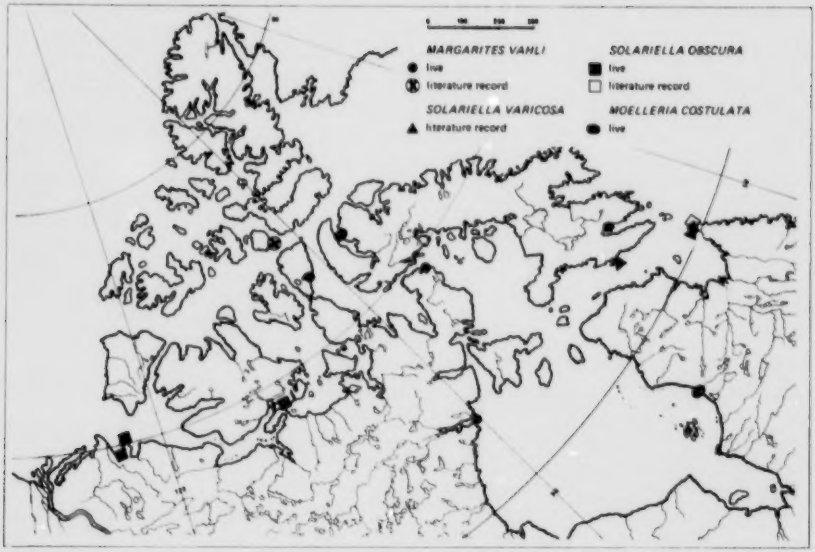
12
MARSENINA GLABRA
(Couthouy). NMC 35275, Evans Strait, N.W.T., (X½), 47

13
VELUTINA PLICATILIS
(Müller). NMC 36317, Foxe Basin, N.W.T., (X3), 49

14a, b
ONCHIDIOPSIS GLACIALIS
(M. Sars) from Odhner, 1913, Pl. 2:19, 25. Svalbard, (X1), 51

15
ASTYRIS ROSACEA
(Gould). NMC 35443, Port Burwell, Qué., (X2), 64

16
COLUS ROSEUS
(Dall). NMC 36539, Herschel Island, Y.T., (X½), 74



Map 12

Canadian Arctic literature records

Port Burwell, Hudson Strait* (Whiteaves 1885: 60DD).

Also recorded from East Greenland to Hebrides, Svalbard, Norway, Soviet Arctic, Bering Sea, Sitka, Eastern Canada, and New England (Thorson 1944); Labrador (Thorson 1951); Point Barrow, Alaska (MacGinitie 1959). Depths from 4 to 2587 m (Clarke 1962).

SOLARIELLA VARICOSA (Mighels and Adams)
Plate II, fig. 4a, b. Map 12.

Margarita varicosa Mighels and A. Adams, 1842: 46, pl. 4: 4.

Type locality: "Bay Chaleur" [Baie de Chaleur, Quebec].

This species is recorded from Port Burwell, Hudson Strait by Dall (1924*a*: 34A) and from Ashe Inlet, "Upper Savage Island" [Big Island], Hudson Strait by Whiteaves (1885: 58DD). The shell is recognized by its strong longitudinal ribs, its fine spiral threads, and its high spire. Thorson (1951) records it from eastern Canada, Labrador, Hebrides, Svalbard, Norway, Soviet Arctic, Bering Sea, and Japan. Dall (1919) found it in arctic Alaska, and Galkin (1955) records it from "Sandiego." It is not known from either coast of Greenland or from north of Hudson Strait in Canada. Its depth range is from 0 to 355 m (Galkin 1955).

Turbinidae

MOELLERIA Jeffreys, 1865
Type species (by original designation):
Margarita? costulata Möller

MOELLERIA COSTULATA (Möller)
Plate II, fig. 5. Map. 12.

Margarita? costulata Möller, 1842: 8.
Type locality: Greenland.

Margarita minutissima Mighels (1843: 349, pl. 16: 5) is probably a synonym.

Description of specimens

The shell is minute (larger specimen has a diameter of 2.5 mm). Of two specimens, one is a dark reddish brown and the other is grey. There are 3 rapidly enlarging whorls, deep sutures and a blunt apex. The sculpture consists of distinct, close, longitudinal ribs. The umbilicus is quite large and unadorned. The round aperture has a thick calcareous operculum containing 4 whorls.

The shell of this species is recognized by the appearance of the axial sculpture and by the calcareous operculum.

Origin of specimens

Southeast region:
Hudson Bay east–off Nastapoka River (1).

Northeast region:
Admiralty Inlet–Arctic Bay (1).

Specimens were collected alive from depths of 16 and 53 m.

Recorded for the first time from arctic Canada.

Also recorded from Cape Cod to Labrador (Whiteaves 1901); West Greenland, East Greenland, Svalbard, Murman Sea, Franz Joseph Islands, White Sea, Iceland to Shetlands, and south to off Morocco (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 7.5 (eastern Canada) to 1943 m (Morocco) (Thorson 1944).

Lacunidae

LACUNA Turton, 1827
Type species (by original designation):
Helix lacuna Montagu [=*Turbo puteolus* Turton]

LACUNA cf. *GLACIALIS* Möller
Plate I, fig. 18. Map 13.

Lacuna glacialis Möller, 1842: 9.
Type locality: probably Greenland.
Krause (1892: 353) calls *Aquilonaria turneri* Dall a probable synonym.

Description of specimens

The shell is thin and white. Most specimens are small (up to 12 mm long). Three specimens are, however, from 15 to 21 mm long. Five to 6 whorls with rather deep sutures enlarge rather rapidly from a small and round apex. More than half of the specimens are smooth, but the rest bear close and fine spiral lines. The aperture is

about ½ the height of the shell. The outer lip is usually very thin. The inner lip varies considerably: from a thin strip incompletely apressed to the shell, through a narrow plate with a tiny chink toward the top, to a broad plate bearing a groove that ends in a deep chink at the top. The lower lip is everted in one case. The large operculum has its nucleus near the inner edge. A thin brownish yellow periostracum extends beyond the thin outer lip in many specimens.

The shell of this species is recognized mainly by its rounded whorls and umbilicus.

Origin of specimens

Southeast region:
Repulse Bay (1); Frozen Strait (ca. 50).

Northeast region:
Hudson strait—Mill Island (1); Frobisher Bay—near head (2), near mouth (8); Foxe Channel—near Cape Martineau (3); Foxe Basin—near Cape Wilson (1).

Northwest region:
Coronation Gulf—Cape Barrow (1); Amundsen Gulf—off Cape Parry (1).

Specimens were collected alive on rock at depths between 5-10 and 183-208 m.

Recorded for the first time from arctic Canada.

Also recorded from Sea of Okhotsk and Sitka Island [Alaska] (Middendorff 1849); Svalbard (Krause 1892); Gulf of St. Lawrence (Whiteaves 1901). Depths from 5-10 (Amundsen Gulf) to 183-208 m (Amundsen Gulf) (this study).

LACUNA VINCTA (Montagu)
Map 13.

Turbo vinctus Montagu, 1803: 307, pl. 12: 11.
Type locality: Salcombe [England].
Trochus divaricatus Fabricius, 1780: 392.

Reeve (1855: 393) records the varieties *labiosa* and *quadrifasciata* from Port Refuge [Wellington Channel]. It is possible that the specimens were of *L. glacialis* (Möller), from which the shell of this species is distinguished by its straighter sided whorls and its more elongate appearance. It is also recorded from eastern Canada (Bousfield 1960), New England, southwest Greenland, Iceland, British Isles, France, Norway, White Sea, Bering Sea, Japan, and northwest America at depths of from 0 to 64 m (Thorson 1941).

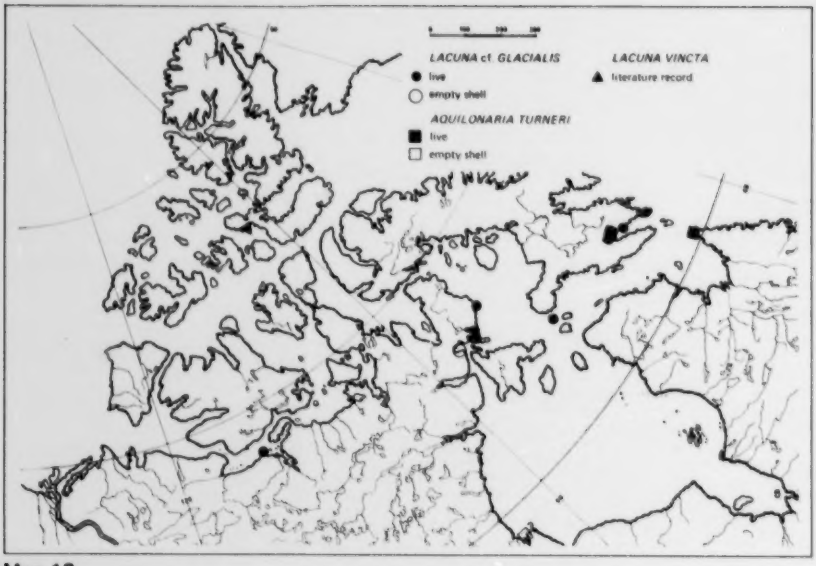
AQUILONARIA Dall, 1887
Type species (by original designation):
Aquilonaria turneri Dall

AQUILONARIA TURNERI Dall
Map 13.

Aquilonaria turneri Dall, 1887: 204, pl. 3: 1-3.
Type locality: Labrador's Reef, Ungava Bay.
See MacGinitie (1959, pl. 2: 8,9) for figures.

Description of specimens

The shell is thin, small (up to about 11 mm), and white. There are 4½ rapidly enlarging and rotund whorls. The inner lip varies in thickness but is rather narrow.



Map 13

There is either no umbilicus or a very narrow chink. A heavy, orange-brown periostracum extends past the outer lip in some specimens.
The shell of this species is recognized by its rounded appearance, little or no umbilicus, and bright periostracum.

Origin of specimens

Southeast region:
Hudson Bay west – near Churchill (1 empty shell).

Northwest region:
Coronation Gulf (20 may be this species).

Northeast region:
Frobisher Bay (1).

Recorded for the first time from arctic Canada since described.

Also recorded from Point Barrow, Alaska (MacGinitie 1959); north of Bering Strait (Dall 1887). Depths to 170 m (Point Barrow) (MacGinitie 1959).

Littorinidae

LITTORINA Férussac, 1821
Type species (by original designation):
Turbo littoralis Linnaeus

LITTORINA OBTUSATA (Linnaeus)

Turbo obtusatus Linnaeus, 1758: 761.
Type locality: "O. Septentrionali."

Littorina palliata Say, 1821: 240.

For figures see Tryon (Vol. IX, pl. 41: 5-8).

Halkett (1898: 80) records this species as *Littorina palliata* from the region between the bottom of Ungava Bay and King George Sound, Hudson Strait. It is also recorded by Pelletier *et al.* (1968: 574) from southeast Hudson Bay and James Bay. The shell is best distinguished from that of *L. saxatilis* by the blunter spire and the more rapidly enlarging whorls. The species is also recorded from New Jersey to Labrador (Bousfield 1960); West Greenland, Jan Mayen, Iceland, Faroe Islands, Svalbard, Norway, and Novaya Zemlya at depths of from 0 (Iceland) to about 150 m (Greenland) (Thorson 1941).

LITTORINA SAXATILIS (Olivi)
Plate I, fig. 19. Map 14.

Cochlea lunares groenlandicae Chemnitz, 1781: 235, pl. 185: 1855a-g (work not binomial).

Turbo saxatilis Olivi, 1792: 172, pl. 5: 3a-d (not seen). Type locality: Adriatic Sea.

Turbo rudis Maton, 1797: 277 (not seen).

Turbo tenebrosus Montagu, 1803: 303.

Littorina groenlandica Möller, 1842: 9.

For other possible synonyms and figures, see Dautzenburg and Fischer (1912).

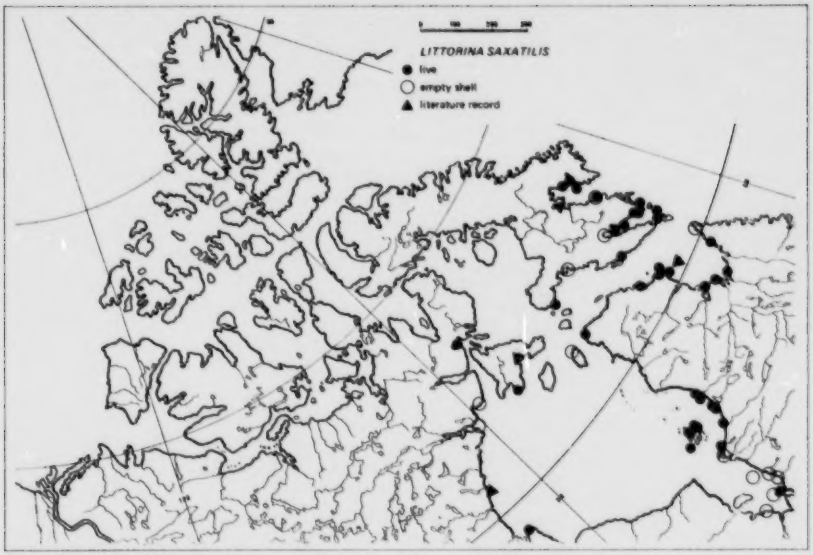
Description of specimens

The shell is relatively thick and up to 19 mm long. Although most specimens are dark brownish purple, they can be found from white and pale yellow to reddish brown. A few are grey or black. Some specimens from almost every locality are decorated with spiral bands, streaks, or spots, which are usually brown or white. There are 5 to 6 whorls and a rather pointed apex. The shells vary from a rather elongate to a rotund shape. The spiral sculpture consists of incised lines, ribs, or ridges that vary in width and distance apart. Many shells have repaired cracks at intervals that run in the direction of the distinct growth lines. The oval aperture has a smoothly curved outer lip. The inner lip is everted at the base and varies from very curved to quite straight. The operculum is thin and has its nucleus on the inner side. There is a thin, light brown periostracum.

The shell of this species is recognized mainly by its thickness and colour; its lack of umbilicus and pointed apex best distinguish it from other northern species of *Littorina*.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (15), Hopes Advance Bay (9), Diana Bay (ca. 50), Wakeham Bay (ca. 170), King George Sound (8), Digges Islands (ca. 150); Ungava Bay–east coast (15), south coast (ca. 125), west coast (ca. 240); James Bay–east side South Twin Island (ca. 30), Charlton Island (ca. 100), Old Factory Bay (3), between Albany and Moose Rivers (ca. 20), off Eastmain (ca. 45); Hudson Bay east–Long Island to mainland (30), Great Whale River (ca. 100), Belcher Islands (ca. 450), Richmond Gulf and nearby (ca. 500), northern Nastapoka Islands (ca. 650); Evans Strait–Coral Harbour (ca. 50); Hudson Bay west–Churchill (33), Chesterfield Inlet (ca. 75); Roes Welcome Sound–Cape Fullerton (ca. 300); Repulse Bay (1).



Map 14

Northeast region:
Hudson Strait–Lake Harbour (ca. 360), Big Island (37), near Cape Dorset (ca. 50); Frobisher Bay–near head (ca. 140), near mouth (ca. 150); Davis Strait–between Frobisher Bay and Cumberland Sound (ca. 110); Cumberland Sound–near Moodie Island (9), Pangnirtung (ca. 125).

Specimens were collected alive from the intertidal zone.

Canadian Arctic literature records

King George Sound, Hudson Strait* and Ungava Bay (Whiteaves 1901: 172, as *Littorina rudis*); shores of Ungava Bay (Dall 1887: 203, as *Litorina grönlandica*); Akpatok Island, Ungava Bay (Davis 1936: 329); Hudson Strait (Halkett 1898: 80, as *Littorina rudis*); Charlton* and Cary Islands, James Bay (Richards 1936: 539, as *Littorina rudis*); James Bay (Stimpson 1862: 97, as *Littorina grönlandica*); Hudson and James bays (Pelletier *et al.* 1968: 574); east coast Hudson Bay* (Clarke 1963*a*: 2); Southampton Island (Brooks 1935: 2, as *Littorina rudis tenebrosa*); Eskimo Point, Hudson Bay (Laurson 1946: 57); Lake Harbour, Baffin Island (Oughton 1940: 4); Baffin Island (Bousfield 1960: 16); Frobisher Bay* and Cumberland Sound* (Ellis 1955: 228); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1946: 324, as *Littorina tenebrosa*); Cumberland Sound (Dall 1879: 146, as *Litorina grönlanidca* [*sic*]; Cape Barrow, Coronation Gulf (Dall 1919*a*: 16A, as *Littorina rudis* var. *grönlandica*).

Also recorded from New Jersey (Bousfield 1960); New England to Labrador, West Greenland, southeast Greenland, Iceland, Faroe Islands, British Isles, Black Sea, Mediterranean Sea, western Europe, Norway, Svalbard, Soviet Arctic, Japan, and northwest America to 94 m (West Greenland) (Thorson 1944).

Hydrobiidae

HYDROBIA Hartman, 1821
Type species (by subsequent designation, Gray, 1847); *Helix acuta* Draparnaud

HYDROBIA MINUTA (Totten)
Plate II, fig. 6. Map 15.

Turbo minutus Totten, 1834: 369, fig. 7.
Type locality: Massachusetts and Rhode Island.

This species may well be a synonym of *Hydrobia ventrosa* (Montagu) 1803: 317).

Description of specimens

The shell is thin, minute (up to 3.5 mm long), and yellowish horn colour when fresh. The 5 to 6 whorls are tumid, the sutures are distinct but shallow, and the apex is small and practically flat. Some specimens are slightly elongated; others are more rotund and have a larger body whorl. The shell is marked only by lines of growth. There is a tiny umbilical chink. The aperture is oval and variable in width.

The shell of this species is recognized by the tumid whorls, the small apical whorls, and the lack of sculpture.

Origin of specimens

Southeast region:
James Bay—Charlton Island, Saltwater Lake (ca. 500).

Specimens were all collected dead but they appear fresh.

Canadian Arctic literature records

Charlton Island* and mouth of Moose River, James Bay (Richards 1936: 540); James Bay (Pelletier *et al.* 1968: 574).

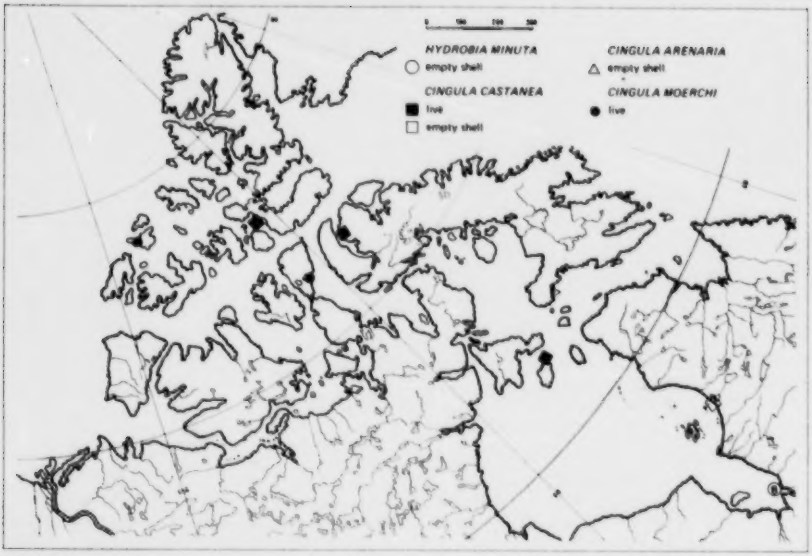
Also recorded from eastern Canada (Bousfield 1960); Labrador (dead) (Packard 1865); and if synonymous with *H. ventrosa* from Norway (Sars 1878); and Great Britain and western Europe.

Rissoidae

CINGULA Fleming, 1828
Type species (by original designation): *Turbo cingillus* Montagu

CINGULA cf. *ARENARIA* (Mighels and Adams)
Plate II, fig. 7. Map 15.

Cingula arenaria Mighels and Adams, 1842: 49, pl. 4: 24.
Type locality: Casco Bay, Maine.



Map 15

Description of specimen

The shell is rather thin, minute (2.7 mm long), and white. About 5 whorls with distinct sutures enlarge regularly from a blunt apex. The axial sculpture consists of fine, straight, raised lines, which are most prominent on the ventral surface of the shell. The spiral ribs are wide and barely rounded. The oval aperture is less than ½ the height of the shell. There is a rather narrow umbilical slit.

The raised axial lines and the fewer, stronger, spiral ribs best distinguish the shell of this species from that of *C. castanea*.

Origin of specimen

Northeast region:
Hudson Strait—near Cape Dorset (1 collected empty).

Recorded for the first time from arctic Canada.

Also recorded from South Atlantic, Tristan da Cunha, Newfoundland, West Greenland, East Greenland, Iceland, Norway, and Svalbard at depths of from 4 (East Greenland) to about 190 m (Tristan da Cunha) (Thorson 1944).

CINGULA CASTANEA (Möller)
Plate II, fig. 8. Map 15.

Rissoa castanea Möller, 1842*a*: 83 (not seen).
Type locality: Greenland.

Description of specimens

The shell is moderately thin, minute (up to 4.4 mm long), and light brown or light yellow. There are 4½ whorls with well-impressed sutures and a blunt apex. Except

for the first 1½ whorls, the shell is covered with low, broad, equidistant spiral ribs that are a little lighter in colour than the interspaces. There is no umbilicus. The aperture is oval and the inner and lower parts of the lip are everted.

The shell of this species is recognized by its rapidly enlarging, rather inflated whorls and its lack of axial sculpture. The broad ribs best distinguish the shell from that of *C. moerchi*.

Origin of specimens

Southeast region:
Hudson Bay east–Richmond Gulf (1 worn shell, may be of this species); Evans Strait–Cape Pembroke (1).

North region:
Wellington Channel (2 worn shells may be of this species).
Specimens were collected alive on rock at depths of from 5 to 16 m.

Northeast region:
Admiralty Inlet–Arctic Bay (10).

Canadian Arctic literature records

Arctic Bay, Baffin Island* (Ellis 1960: 40).
Also recorded from New England (Verrill 1883); Quebec and Labrador (Whiteaves 1901); Newfoundland, West Greenland, East Greenland, Iceland, Norway, and Novaya Zemlya (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 2 (East Greenland) to 132 m (Davis Strait) (Thorson 1944).

CINGULA MOERCHI Collin
Plate II, fig. 9. Map 15.

Cingula mörchi Collin, 1887: 454, pl. 40, 5a, b.
Type locality: Kara Sea.

Description of specimens

The shell is thin, transluscent, minute (up to 3.2 mm), and white. From a flat apex 4½ rounded whorls enlarge rather rapidly. On the early whorls of a few specimens some of the fine growth lines are strong and raised. The sharp, narrow spiral ribs (9-13 on the body whorl) are spaced at least five times their own width apart. There is a narrow umbilicus. The aperture is wide and ovate. The thin outer lip is modified by the spiral ribs, the lower lip is everted, and the inner lip is high and sharp. The aperture is almost filled by the thin operculum.

The shell of this species is recognized by its numerous sharp, narrow spiral ribs and vertically depressed whorls.

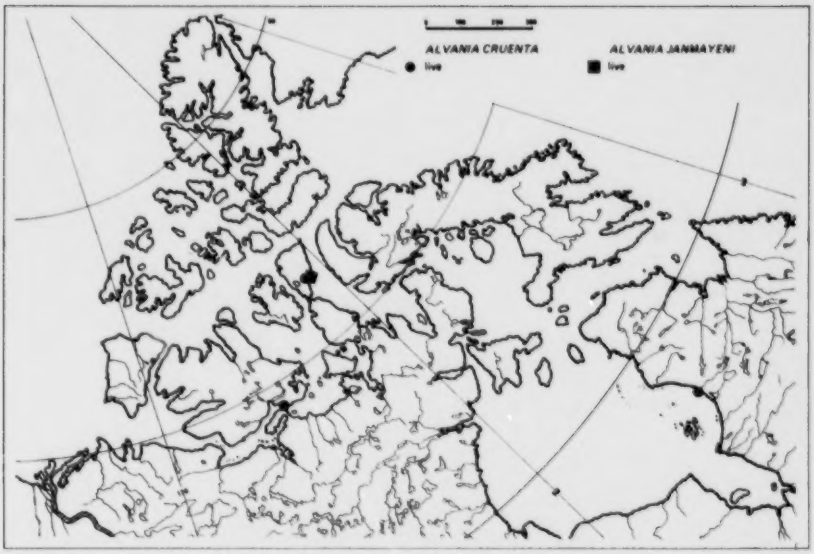
Origin of specimens

Northwest region:
Prince Regent Inlet–Creswell Bay (8).

North region:
Wilkins Strait (3).
Specimens were collected alive on mud in hauls from depths of 7-12 and 33 m.

Recorded for the first time from arctic Canada.

Also recorded from East Greenland and Svalbard (Thorson 1944); Arctic Ocean off Franz Joseph Islands and New Siberian Islands (Gorbunov 1946). Depths from 7-12 m (south of Borden Island) (this study) to 360 m (off Franz Joseph Islands) (Gorbunov 1946).



Map 16

ALVANIA Risso, 1826
Type species (by subsequent designation, Monterosato, 1884):
Alvania sardea Risso [= *Alvania montagui* (Payradeau)]

ALVANIA cf. *CRUENTA* Odhner
Plate II, fig. 10. Map 16.

Alvania cruenta Odhner 1915: 167, pl. 1: 1-6.
Type locality: Svalbard.

Description of specimens

The shell is thick, minute (up to 2 mm long), and bright reddish or yellowish chestnut. There are 4½ loosely coiled whorls with deep sutures and a flat apex. Heavy spiral ribs (up to 6 on the body whorl), which start at some distance from the sutures, give the whorls a shouldered appearance. These ribs are high but rounded, and more deeply coloured than the interspaces. On the early whorls of some specimens, axial lines cut into the spiral ribs and give them a bumpy appearance. There is an umbilical groove. The aperture is ovate (nearly round in some specimens). The lip is thick and turns down in a few specimens. The large, round operculum almost fills the aperture.

The shell of this species is recognized mainly by its strong spiral ribs, small size, and reduced axial sculpture.

Origin of specimens

Southeast region:
Hudson Bay east–Nastapoka River mouth (4).

Northeast region:
Prince Regent Inlet–Creswell Bay (1).

Northwest region:
Dease Strait–near Cambridge Bay (9).

Specimens were collected alive on mud at a depth of 49 m.

Also recorded from West Greenland and Novaya Zemlya (Odhner 1915); Arctic Ocean north of Laptev Sea and New Siberian Islands (Gorbunov 1946). Depths of from 19 m (Laptev Sea) (Gorbunov 1946) to 234-254 m (Svalbard) (Odhner 1915).

ALVANIA JANMAYENI (Friele)
Plate II, fig. 11. Map 16.

Rissoa sibirica Leche, 1878: 38, pl. 1: 10a, b; *nomen oblitum.*
Rissoa Jan Mayeni Friele, 1878: 224, pl. 1: 4a, b.

Type locality: Jan Mayen.

Description of specimens

The shell is thick, minute (up to 3.5 mm long), and bright reddish chestnut. The body whorl in 2 specimens is of a lighter colour. There are 5½ rather loosely coiled whorls with strong shoulders and deep sutures. Strong axial folds dominate the early whorls and extend just past the suture on the body whorl. There are also wide, rounded, close-set spiral ribs; in one case they are of a darker colour. There is no umbilicus, but in one specimen the inner lip is not firmly appressed to the shell, leaving a chink. The oval aperture is quite filled by a very thin operculum.

The shell of this species is recognized mainly by the shouldered whorls and by the appearance of the sculpture.

Origin of specimens

Northeast region:
Prince Regent Inlet–Creswell Bay (3).
Specimens were collected alive on mud and clay at 33 m depth.

Recorded for the first time from arctic Canada.

Also recorded from Eastern Canada (Whiteaves 1901); New England, West Greenland, East Greenland, Iceland, Svalbard, and Soviet Arctic to Siberian Ice Sea (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 5-8 m (East Greenland) (Thorson 1944) to 2358 m (Clarke 1962).

Turritellidae

TACHYRHYNCHUS Mörch, 1868
Type species (by original designation):
Turritella reticulata Mighels and C.B. Adams

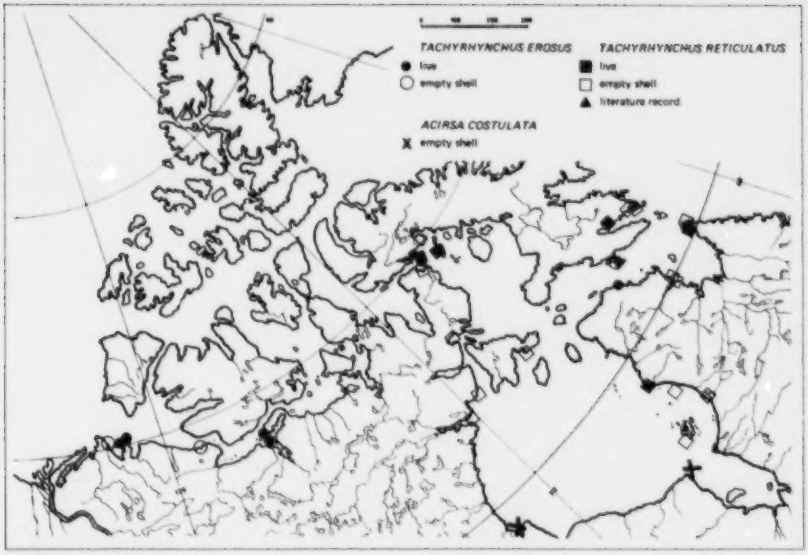
TACHYRHYNCHUS EROSUS (Couthouy)
Plate I, fig. 20. Map 17.

Turritella erosa Couthouy, 1838: 103, pl. 3: 1.

Type locality: Massachusetts Bay.

Description of specimens

The shell is quite thick, up to about 25 mm long, and bluish white. About 9 whorls enlarge very slowly from a pointed apex (worn or broken on most specimens). Fine growth lines are the only axial sculpture. Flat spiral ribs, up to 8 on the body whorl, vary in width and height. The interspaces also vary in width and depth. The



Map 17

oval aperture is about 1/5 the height of the shell. The outer lip is crenulated, and the inner lip is slightly thickened. The operculum is thin, round, and spiralled from a central nucleus. There is a smooth, thick, closely adherent, yellowish brown periostracum.

The lack of axial ribs and the straighter sided whorls best distinguish the shell of this species from that of *T. reticulatus*, and the strong flat spiral ribs differentiate it from that of *Acirsa costulata*.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (4), King George Sound (1); Ungava Bay–Forbes Sound (2).

Northeast region:
Hudson Strait–Big Island (1).

Northwest region:
Bathurst Inlet–Baychimo Harbour (35), mouth (ca. 100); Dolphin and Union Strait (4); Amundsen Gulf–off Cape Parry (4); Franklin Bay (3).

Specimens were collected alive at depths of from 12.8 to 68 m.

Canadian Arctic literature records

Port Burwell* and "Upper Savage Island," Hudson Strait (Whiteaves 1885: 59DD, 60DD); between King George Sound and Ungava Bay (Whiteaves 1901: 174); northeast and southwest Hudson Bay (Pelletier *et al.* 1968: 574); Dolphin and Union Strait* (Dall 1919a: 16A).

Also recorded from New England to Labrador, West Greenland, East Greenland, Svalbard, Soviet Arctic to Bering Sea, Aleutians, Unalaska, and Japan (Thorson 1944). Depths of from 12.8 m (Bathurst Inlet) (this study) to 355 m (West Greenland) (Thorson 1944).

TACHYRHYNCHUS RETICULATUS (Mighels and Adams)
Plate I, fig. 21. Map 17.

Turritella reticulata Mighels and Adams, 1842: 50, pl. 4: 19.
Type locality: "Bay Chaleur" [Baie de Chaleur, Québec].

Description of specimens

The shell is moderately thin, up to 24 mm long and dingy white. About 11 whorls enlarge slowly from a pointed apex. There are numerous straight axial ribs and low, close-set spiral ribs. The aperture is ovate and variable in the proportion of its width to its height. It is about 1/5 the height of the shell. The outer lip is crenulated in many specimens and the lower lip is slightly everted. The operculum is multi-spiralled from a central nucleus. There is a thin, flaky, yellowish periostracum.

The axial ribs and the more rounded whorls best distinguish the shell of this species from that of *T. erosus,* and the larger number of whorls, the more distinct sculpture, and the more distant spiral lines distinguish it from that of *Acirsa costulata.*

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (3); Ungava Bay – Near Payne Bay (6); Hudson Bay east–west of Belcher Islands (25), Richmond Gulf (1), off Broughton Island (4), near Port Harrison (ca. 100); Evans Strait (10); Hudson Bay west–Chesterfield Inlet (1); Roes Welcome Sound – Cape Fullerton (6); Repulse Bay (1).

Northeast region:
Frobisher Bay–mouth (1), Countess of Warwick Sound (1), near settlement (1); Foxe Basin–north (3); Fury and Hecla Strait (5). Specimens were collected alive on mud and rock at depths of from 22 to 106 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Dall 1924*a*: 34A, 35A); Port Burwell* and "Upper Savage Island," Hudson Strait (Whiteaves 1885: 59DD, 60DD).

Also recorded from New England, Labrador, West Greenland, East Greenland, and Svalbard (Thorson 1944); Point Barrow, Alaska, Bering Sea, Aleutians, and British Columbia (MacGinitie 1959). Depths from 3 (Labrador, New England, Bering Sea) to 312 m (West Greenland) (Thorson 1944).

Epitoniidae

ACIRSA Mörch, 1857
Type species (by monotypy):
Scalaria borealis Beck [=*Turitella costulata* Mighels and Adams]

ACIRSA COSTULATA (Mighels and Adams)
Map 17.

Scalaria borealis Beck, 1839: 120: *nomen dubium.*

Turitella costulata Mighels and Adams, 1842: 50, pl. 4: 20.
Type locality: Casco Bay.

See Clench and Turner (1950) for other synonyms and figures.

Description of specimens

The shell is moderately thin, up to 19 mm long, and greenish white. Nine slowly enlarging whorls have shallow sutures. The axial ribs, present in specimens from other regions, are not visible in these worn specimens, but spiral lines are just discernible. The aperture is very small and ovate, and about ¼ the height of the shell. The thickened inner lip is everted at the base.

Higher whorls, shallower sutures, and finer, closer spiral lines best distinguish the shell of this species from those of *Tachyrhynchus erosus* and *Tachyrhynchus reticulatus*.

Origin of specimens

Southeast region:
Hudson Bay west—off Cape Henrietta Maria (1), off Churchill (1).

Specimens were collected empty.

Recorded from the Quaternary at Richmond Gulf, Hudson Bay, and James Bay (Clench and Turner 1950: 246).

Also recorded from Nova Scotia to Massachusetts (Clench and Turner 1950); West Greenland (Posselt and Jensen 1898). Depths from "near low water to. . . about 50 fathoms" (Clench and Turner 1950: 230).

Trichotropidae

TRICHOTROPIS Broderip and Sowerby, 1829
Type species (by original designation):
Turbo bicarinatus Sowerby

TRICHOTROPIS BICARINATA (Sowerby)
Plate III, fig. 3. Map 18.

Turbo bicarinatus Sowerby, 1825: 12, pl. 9.
Type locality: Newfoundland.

Trichotropis sowerbiensis Lesson, 1832: 8, pl. 41: 1-3.

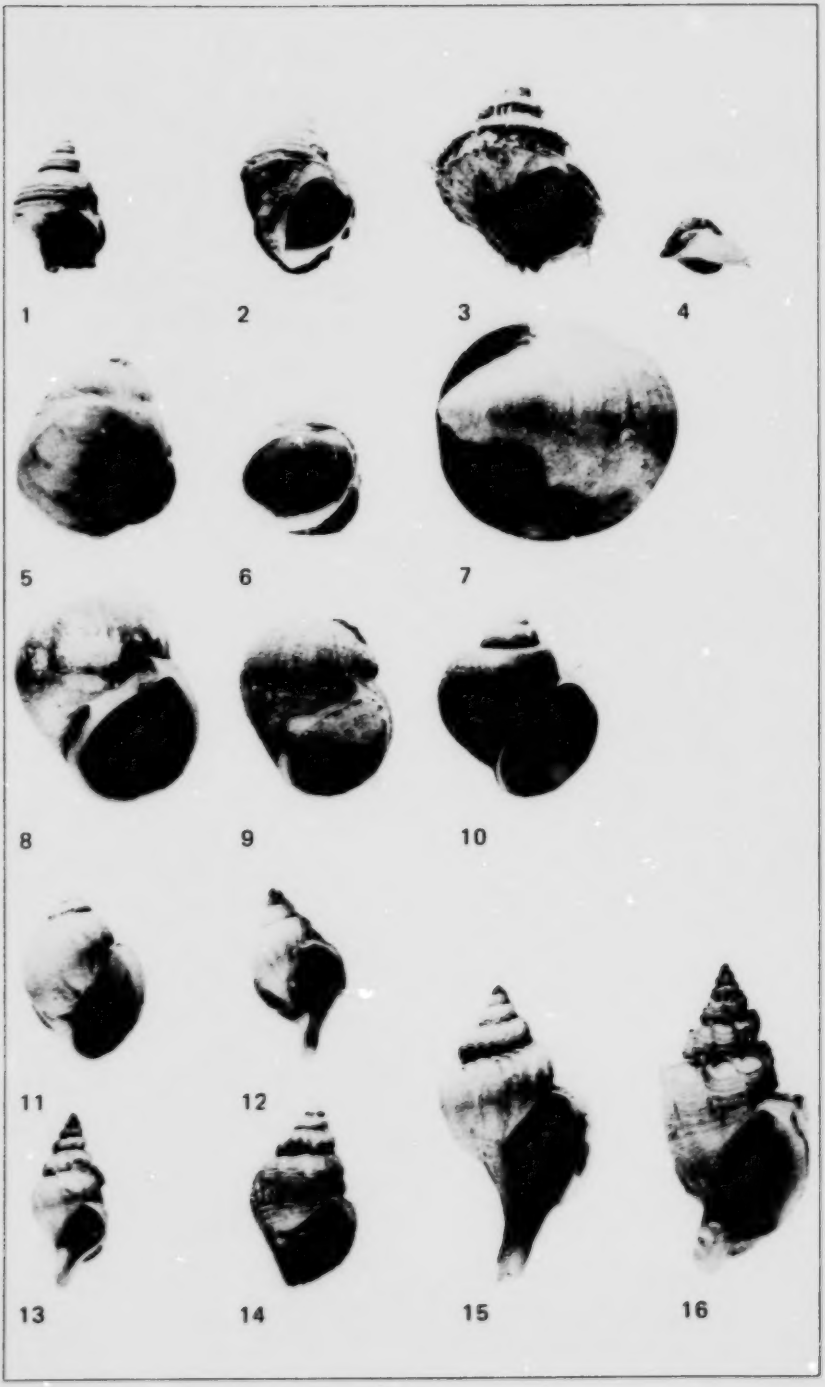
Trichotropis tenuis Smith, 1877: 135.

Grieg (1909: 28) adds *Trichotropis hjorti* Friele to the synonymy.

Description of specimens

The shell is extremely thin, of moderate size (largest specimen is 30 mm in diameter and 37 mm high), and white. The 6 whorls are very tumid and so rapidly enlarging that the body whorl is more than 2/3 the height of the shell. The sutures are deep. Apart from faint and fine lines of growth, the sculpture consists of up to 2 low spiral ribs on the body whorl (one adult specimen has only 1). The columella is curved. The callus is narrow, with the inner lip detached. There is a deep umbilicus in a rather large round depression. The aperture is nearly round. The outer lip is curved smoothly to the base where there is a barely visible canal. The laminate operculum is 'comma' shaped. The periostracum is thin and horn coloured. On it, to a greater or lesser degree, are long bristles at the ribs. In one specimen there are also bristles around the edge of the umbilicus.

The rotund shape and the relative lack of sculpture distinguish the shell of this species from those of other *Trichotropis* species.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Canadian Arctic literature records

North coast of Jones Sound (Grieg 1909: 28); Cape Louis Napoleon [Kane Basin] (Smith 1877: 135 and 1878: 226, as *Trichotropis tenuis*); Couthouy (1838: 110) records *T. sowerbiensis* from "Melville's I., Arctic Seas", wrongly quoting Lesson (1832: 9), who described it from Newfoundland.

Also recorded from West Greenland, East Greenland, Icy Cape, and Bering Sea (Thorson 1951); Arctic Ocean, north of Svalbard (Golikov 1964); Point Barrow, Alaska, south to Nunivak Island and northern Japan (MacGinitie 1959). Depths from 10 m (Ungava Bay) (this study) to 500 m (Melville Bay) (Thorson 1944).

TRICHOTROPIS BOREALIS Broderip and Sowerby

Plate III, fig. 2. Map 19.

Trichotropis borealis Broderip and Sowerby, 1829: 375.
Type locality: Melville Island.

Trichotropis costellatus Couthouy, 1838: 108, pl. 3: 2.

Lovén (1846: 15) lists other old synonyms.

Origin of specimens

Southeast region:
Ungava Bay—Adlorilik (1); Repulse Bay (1).

Northeast region:
Frobisher Bay—Countess of Warwick Sound (3); Foxe Basin—southwest (1); Prince Regent Inlet—near Creswell Bay (3).

Specimens were collected alive on clay, mud, sand, gravel, and rock at depths of from 10 to 192 m.

Plate III (all actual size)

Figure

1
TRICHOTROPIS CONICA
(Möller). NMC 35838,
Evans Strait, N.W.T., 46

2
TRICHOTROPIS BOREALIS
Broderip and Sowerby. NMC 35219,
W. Devon Island, N.W.T., 43

3
TRICHOTROPIS BICARINATA
(Sowerby). NMC 35538,
Ungava Bay, Que., 41

4
CAPULACMAEA RADIATA
(M. Sars). NMC 24080, Foxe Basin,
N.W.T., 53

5
VELUTINA UNDATA
Brown. NMC 35713, Frobisher Bay,
N.W.T., 49

6
VELUTINA VELUTINA
(Müller). NMC 36592,
Roes Welcome Sound, N.W.T., 51

7
CAPULACMAEA RADIATA
(M. Sars). NMC 36584, Foxe Basin,
N.W.T., 53

8
LUNATIA PALLIDA
(Broderip and Sowerby). NMC 13026,
Cape Dorset, N.W.T., 58

9
NATICA CLAUSA
Broderip and Sowerby. NMC 35618,
Ungava Bay, Qué., 56

10
AMAUROPSIS PURPUREA
Dall. NMC 35074, Warren Point,
N.W.T., 55

11
AMAUROPSIS ISLANDICA
(Gmelin). NMC 35925, Jeffrey's
Lodge, Atlantic Ocean, 54

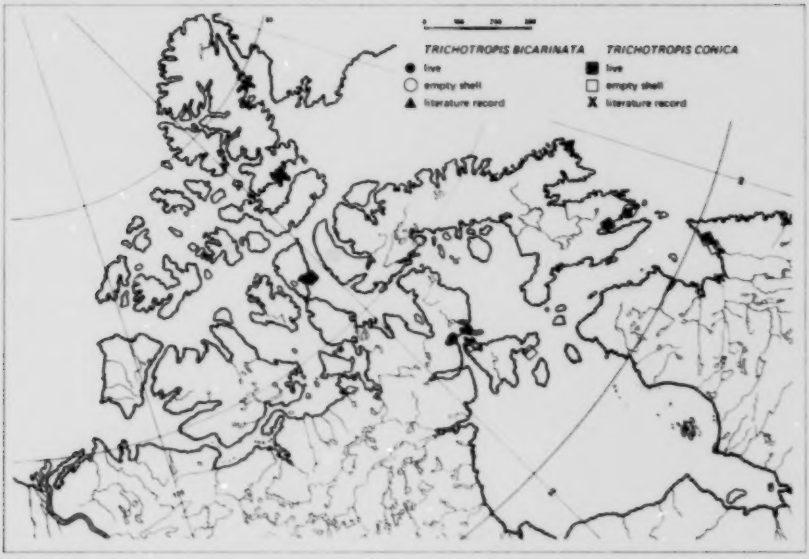
12
BOREOTROPHON PACIFICUS
(Dall). NMC 35561, Bathurst Inlet,
N.W.T., 62

13
BOREOTROPHON TRUNCATUS
(Strøm). NMC 35109, east Hudson
Bay, 62

14
ADMETE COUTHOUYI
(Jay). NMC 24039, Ungava Bay,
Que., 107

15
BOREOTROPHON CLATHRATUS
(Linnaeus). NMC 38507, Franklin
Bay, N.W.T., 60

16
BOREOTROPHON FABRICII
(Möller). NMC 36609, Frozen Strait,
N.W.T., 60



Map 18

Description of specimens

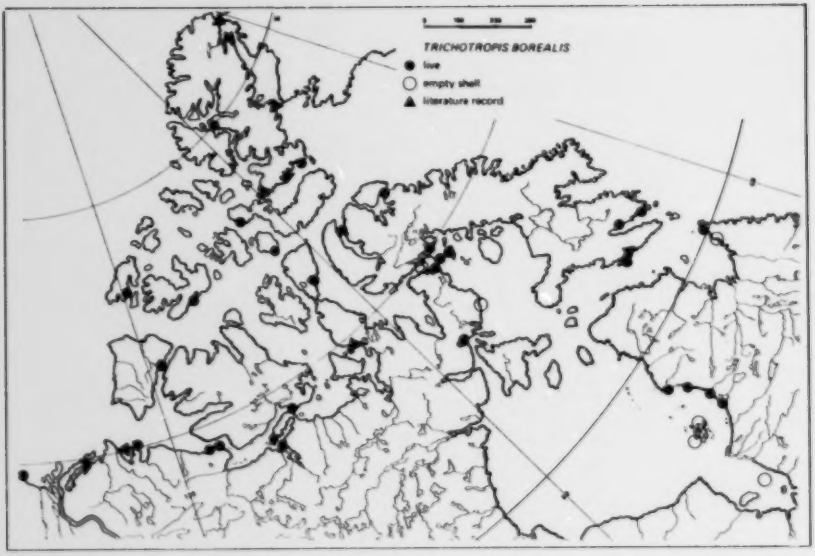
The shell is thin, up to 22 mm long, and white. There are 4 to 5 rather loosely coiled whorls and a pointed apex. The body whorl is $^2/_3$ the height of the shell. Some specimens have flatter whorls and an elongate appearance, whereas others are more rotund. The shell is traversed by numerous and fine slightly raised growth lines and sharp, well-spaced growth rests. Spiral ribs vary from shell to shell in width, height, and number: they are, however, rounded and clearly defined. Many shells have 2 or more carinae. The columella is curved. The callus is narrow, thickened, and not completely appressed to the shell; the inner lip sometimes has a slight projection at the base. Most specimens have a small umbilicus. The aperture is more than ½ the height of the shell and, although variable, is usually wide. The crenulated outer lip is curved at the top and obliquely flattened toward the base, where there is a very short and narrow canal. The operculum is small and oval, with a slightly pointed base and well-spaced laminae. Later whorls are covered with a pale yellow or reddish brown periostracum bearing well-spaced bristles on the stronger spiral ribs of each whorl.

The shell of this species is recognized mainly by the presence of an umbilicus and the appearance of the bristles on the periostracum.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (10); Ungava Bay–east (3); James Bay–South Twin Island (1); Hudson Bay east–Belcher Islands (6), near Richmond Gulf (10), near Mowat Island (2), off Cotter Island (2), Hopewell Sound (42); Repulse Bay (6).

Northeast region:
Hudson Strait–Big Island (5); Frobisher Bay–near settlement (2), Countess of Warwick Sound (2); Foxe Basin west–off Cape Wilson (1), north (35); Fury and Hecla Strait (3); Prince Regent Inlet–Creswell Bay (19); Admiralty Inlet–Arctic Bay (5); Eclipse Sound (1).



Map 19

North region:
Barrow Strait–near Resolute Bay (36); Viscount Melville Sound–Winter Harbour (2); Crozier Channel–near Mould Bay (19); Penny Strait (1); Jones Sound –Craig Harbour (16); Eureka Sound–Slidre Fiord (ca. 90).

Northwest region:
Dease Strait (39); Bathurst Inlet–near Baychimo Harbour (ca. 50); Dolphin and Union Strait (9); Amundsen Gulf–Cape Parry Harbour (1); Liverpool Bay (1); Prince of Wales Strait–south (1); Mackenzie Bay–near Herschel Island (1).

Specimens were collected alive on clay, mud, sand, gravel, and rock at depths of from 5 to 95 m.

Canadian Arctic literature records

North and south sides of Hudson Strait* (Whiteaves 1885: 59DD, 60DD); Port Burwell, Hudson Strait* and Winter Harbour, Melville Island* (Dall 1924, 1924*a*: 31A, 34A, 35A); Southeast Hudson Bay (Pelletier *et al.* 1968: 574); Lake Harbour, Baffin Island (Oughton 1940: 3); Foxe Basin, Arctic Bay*, and Eclipse Sound* (Ellis 1960: 40); Josephine Bay, Boothia Peninsula (Wagner 1964*a*: Tab. I); Assistance Bay [Barrow Strait] (Sutherland 1852: cci, as *Trichotropis costellatus*); Hell Gate Channel, Jones Sound, and Rice Strait (Grieg 1909: 27); Discovery Bay and Dumbell Harbour [northeast Ellesmere Island] (Smith 1877: 136 and 1878: 227); Dolphin and Union Strait* (Dall 1919*a*: 14A-16A); Franklin Bay (MacGinitie 1959: 89).

Also recorded from New England to West Greenland, East Greenland, Iceland, Faroe Islands, British Isles, Norway, Svalbard, Kara Sea, and Bering Sea (Thorson 1944); Point Barrow, Alaska to British Columbia (MacGinitie 1959). Depths from 5 m (west of Devon Island) (this study) to 944 m (Hebrides) (Thorson 1944).

TRICHOTROPIS CONICA Möller
Plate III, fig. 1. Map 18.

Trichotropis conica Möller, 1842: 12.
Type locality: Greenland.

Description of specimens

The shell is very thin, small (up to 17 mm long), and white. Six whorls enlarge slowly from a pointed apex. The shell is covered with delicate lines of growth and has a spiral sculpture of fine and distant ribs. The spiral ribs are low and indistinct between shoulder and suture, but higher at the middle of the body whorl, and toward its base there is a strong keel. Between the keel and the base, the spirals become less distinct and closer together. The columella is nearly straight and the callus is thickened. The squarish aperture is $^1/_3$ the height of the shell. The outer lip is modified by the ribs and keel with a straight line from the latter to the base, where there is a very short and narrow canal. The operculum is oval with a slightly pointed base. A pale yellowish periostracum adheres firmly and covers the shell.

The shell of this species is best distinguished from that of *T. borealis* by the keel, which is low on the body whorl, and by the squarish shape of the aperture.

Origin of specimens

Southeast region:
Ungava Bay–east (2); Evans Strait (1); Frozen Strait (1).

Northeast region:
Frobisher Bay–near settlement (3); Prince Regent Inlet–near Creswell Bay (11).

Specimens were collected alive on mud and clay at a depth of 33 m.

Canadian Arctic literature records

Exeter Sound, Baffin Island (Thorson 1951: 33); Jones Sound (Grieg 1909: 27).

Also recorded from Eastern Canada (Whiteaves 1901); West Greenland, East Greenland, Jan Mayen, and West Finmark (Thorson 1951); Murman Coast and north of Svalbard (Golikov 1964). Depths from 20 m (East Greenland) (Thorson 1944) to 550 m (north of Svalbard) (Golikov 1964).

Aporrhaidae

APORRHAIS da Costa, 1778
Type species (by monotypy):
Aporrhais quadrifidus da Costa
[=*Strombus pespelicani* Linnaeus]

APORRHAIS OCCIDENTALIS (Beck)
Plate V, fig. 8. Map 24.

Rostellaria occidentalis Beck, 1836: pl. 72 (not seen).
Type locality: Gulf of St. Lawrence and Newfoundland.

The specimens described below are most probably of the "subspecies" *A.o. labradorensis* Johnson.

Description of specimens

The shell is very thick, up to 50 mm long, and pale tan or bluish or yellowish white. There are 10 to 11 quite slowly enlarging whorls. The curved axial ribs (22-30 on the penultimate whorl) are low and rounded but distinct. They are crossed by fine, evenly spaced spiral ribs of uniform size. The aperture is about ½ the height of the shell and quite narrow. In the adult there is a wing-like outer lip, which turns up at the top edge and is very thickened and somewhat incurved on the outer edge. The inner lip is oblique and extremely thick. There is a short siphonal canal.

The shell of the young of this species is best distinguished from that of *Plicifusus kroeyeri* by the more numerous, curved ribs and shorter canal. The wing-like outer lip makes the adult shell unmistakeable.

Origin of specimens

Southeast region:
Ungava Bay–southwest (2); Hudson Strait–Wakeham Bay (1), King George Sound (1); Hudson Bay east–between Mansel Island and mainland (2).

Specimens were all collected dead, but several appear fresh.

Canadian Arctic literature records

Hudson Strait (Halkett 1898: 80); Quaternary of arctic Canada (Matthews 1967: 191).

Also recorded from (all subspecies) Massachusetts and Nova Scotia (Johnson 1930); Newfoundland (Dautzenburg and Fischer 1912); Labrador and West Greenland (Thorson 1951). Depths from about 5 (Bousfield 1960) to 1828 m (Clarke 1962).

Lamellariidae

MARSENINA J.E. Gray, 1850
Type species (by monotypy):
Lamellaria prodita Lovén [=*Oxinoe ? glabra* Couthouy]

MARSENINA GLABRA (Couthouy)
Plate II, fig. 12. Map 20.

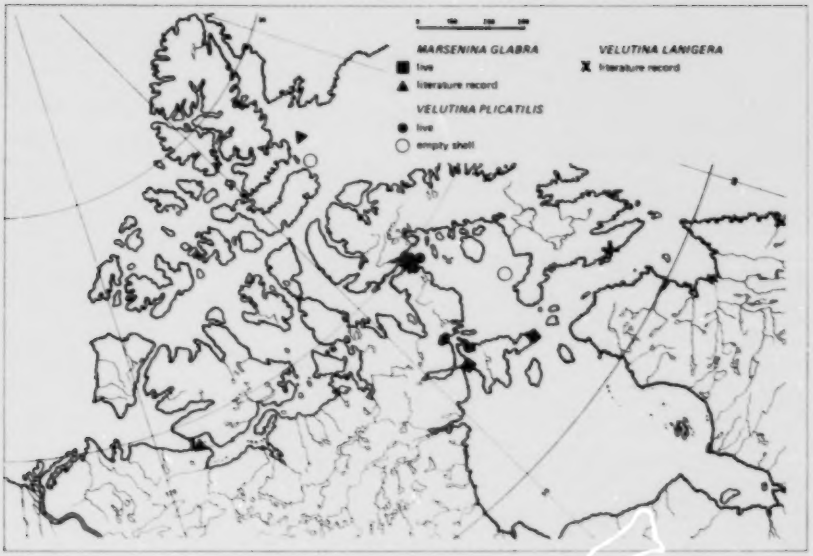
Oxinoe? glabra Couthouy, 1838: 90, pl. 3: 16.
Type locality: Massachusetts Bay.

According to Odhner (1913: 51, 52), *Sigaretus ? groenlandicus* Möller (1842: 10), *Lamellaria prodita* Lovén (1846: 15), and *Marsenina micromphala* Bergh (1853: 350) are synonyms of this species.

Description of specimens

The shell is thin, smooth, small (up to about 18 mm long), and white. The rosy mantle covers all but a portion of the body whorl, which shows at the top. There are about 2 rapidly enlarging whorls. The spire varies in height. The large aperture is longer than it is wide.

This species is best recognized by its enveloping mantle.



Map 20

Origin of specimens

Southeast region:
Evans Strait (1); Roes Welcome Sound (1).

Specimens were collected alive on rock in 40-75 and 73 m.

Canadian Arctic literature records

Off Ellesmere Island (Thorson 1951: 24); Dolphin and Union Strait (Dall 1919*a*: 15A, as *Lamellaria groenlandica*) may be of this species.

Also recorded from Maine, Labrador, West Greenland (Thorson 1951); East Greenland, Iceland, Norway, Svalbard, White Sea, and Siberian Ice Sea, from 38 (Norway) to 1222 m (off Norway) (Thorson 1944).

VELUTINA Fleming, 1821
Type species (original designation):
Bulla velutina Möller

VELUTINA LANIGERA Möller
Map 20.

Velutina lanigera Möller 1842: 10.
Type locality: Greenland.

Oughton (1940: 3) records this species from Lake Harbour, Baffin Island. The shell, recognized by its ridged protoconch, is figured by Odhner (1913: pl. I: 29). It is also recorded from West Greenland, Iceland, Norway, Svalbard, and Point Barrow, Alaska south to Petrel Bank, Bering Sea (MacGinitie 1959) from depths of 7 to 42 m (Odhner 1913).

VELUTINA PLICATILIS (Müller)
Plate II, fig. 13. Map 20.

Bulla plicatilis Müller, 1776: 242.
Type locality: "Daniae et Norvegiae."

Odhner (1913) and MacGinitie (1959) list possible synonyms.

Description of specimens

The shell is small (up to about 22 mm long), and pale yellowish brown, mainly of flexible-horny material. There are 2 to 3 rapidly enlarging whorls. The first 1 or 2 are calcareous but are covered with the coriaceous layer, and in some specimens there is an extremely thin and discontinuous layer of calcareous material even in the body whorl. Concentric growth lines are visible in some specimens.

The shell of this species is recognized by the large coriaceous body whorl and the covered but calcareous early whorls.

Origin of specimens

Southeast region:
Repulse Bay (1); Frozen Strait (3).

Northeast region:
Foxe Basin–southeast (6), northwest (2); Fury and Hecla Strait (2).

Specimens were collected alive on mud and rock at depths of from 40 to 106 m.

North region:
Baffin Bay–off Devon Island (2).

Recorded for the first time from arctic Canada.

Also recorded from Nova Scotia, Newfoundland, West Greenland, East Greenland to Great Britain, Belgium to Norway, Svalbard, White Sea, and Sea of Okhotsk (Thorson 1944); Arctic Ocean off New Siberian Islands (Gorbunov 1946); Point Barrow, Alaska (MacGinitie 1959). Depths from 15 (Norway) to 377 m (Norway) (Thorson 1944).

VELUTINA UNDATA Brown
Plate III, fig. 5. Map 21.

Velutina undata Brown, 1839: 102 (not seen).

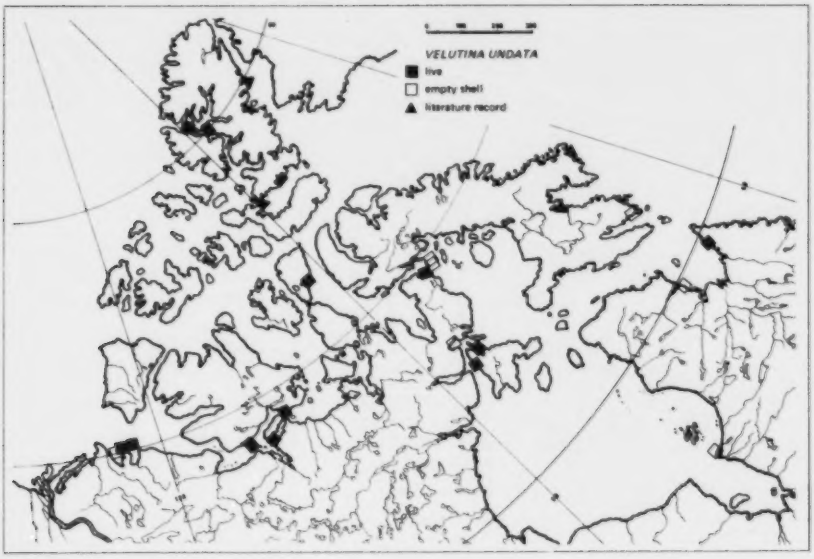
Velutina zonata Gould, 1841: 242, Fig. 160.

Type locality: (Pleistocene) Dalmuir, Scotland.

Description of specimens

The shell is variable in thickness, up to 27 mm long, and pale tan or pinkish. Two to 2½ whorls enlarge very rapidly from an apex that is variable in height. Apart from growth lines, the shells bear fine, very close spiral lines. There is a columellar groove, which forms a wide plate. The aperture is large and varies in the proportion of width to length. The periostracum, where present, is very thin and light brown.

The shell of this species is best recognized by the columellar plate.



Map 21

Origin of specimens

Southeast region:
Ungava Bay–northeast (3), west (2); Hudson Bay east–near Long Island (1); Roes Welcome Sound (1); Repulse Bay (1); Frozen Strait (3).

Northeast region:
Frobisher Bay–Countess of Warwick Sound (3); Foxe Basin–northwest (5); Prince Regent Inlet–Creswell Bay (2).

North region:
Nansen Sound (1); Eureka Sound (4).

Northwest region:
Dease Strait (1); Melville Sound (1); Coronation Gulf (2); Amundsen Gulf–near Cape Parry (4).

Specimens were collected alive on clay, mud, and rock at depths from 29 to 173 m.

Canadian Arctic literature records

"west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 331, as *Velutina zonata*); Exeter Sound, Baffin Island and off Ellesmere Island (Thorson 1951: 26); Jones Sound (Grieg 1909: 25, as *Velutina (Morvillia) zonata*); Franklin Pierce Bay [Kane Basin] (Smith 1877: 13 and 1878: 227, as *Velutina (Morvillia) zonata* var. *grandis*).

Also recorded from New England (Gould 1841); Nova Scotia, West Greenland, East Greenland to the Faroe Islands, Norway, Svalbard, and Soviet Arctic to Bering Sea (Thorson 1944); Point Barrow, Alaska to Kudobin Islands (MacGinitie 1959); North Canadian Basin (Clarke 1963). Depths from 0 (Eastport, Maine) to 1187 m (North Atlantic) (Clarke 1963).

VELUTINA VELUTINA (Müller)
Plate III, fig. 6. Map 22.

Bulla velutina Müller, 1776: 242.
Type locality: "Daniae et Norvegiae."

This is the *Velutina laevigata* of many authors. *Helix laevigatus* Linnaeus 1758 is a *nomen dubium* and *Velutina laevigata* Pennant 1777 is probably a synonym of *V. velutina*. Other possible synonyms are listed by Dautzenburg and Fischer (1912) and Odhner (1913).

Description of specimens

The shell is thin, up to 15 mm in diameter, and white. There are 2½-3½ very rapidly enlarging whorls. The apex varies in both height and convexity. The early whorls seem to be smooth, but on the large body whorl, very low ridges or lines in the direction of growth are crossed by spiral ribs of variable distance apart. The intermediate coriaceous layer of the shell is thick in some specimens and thin in others, but extends past the edge of the inner calcareous layer in most. The aperture is very wide. The periostracum is brownish olive and in many specimens bears short bristles.

The shell of this species is recognized by the spiral sculpture, narrow columella and smooth protoconch.

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (10); Ungava Bay—near Payne Bay (1); James Bay—South Twin Island (1); Hudson Bay east—Belcher Islands (3); Evans Strait (1); Hudson Bay west—off Eskimo Point (1), Chesterfield Inlet (1); Roes Welcome Sound (2); Repulse Bay (1).

Northwest region:
Dease Strait (3); Melville Sound (1); Bathurst Inlet (1).

Northeast region:
Frobisher Bay (1); Foxe Basin—north (6); Prince Regent Inlet—Creswell Bay (1 may be of this species).

North region:
Barrow Strait—Resolute Bay (1); Eureka Sound—Slidre Fiord (2); Prince Gustav Adolph Sea—Isachsen (3).

Specimens were collected alive on mud, sand, and rock at depths of from 12 to 120 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Dall 1924*a*: 34A, as *Velutina laevigata*); Lake Harbour, Baffin Island (Oughton 1940: 3, as *Velutina laevigata*).

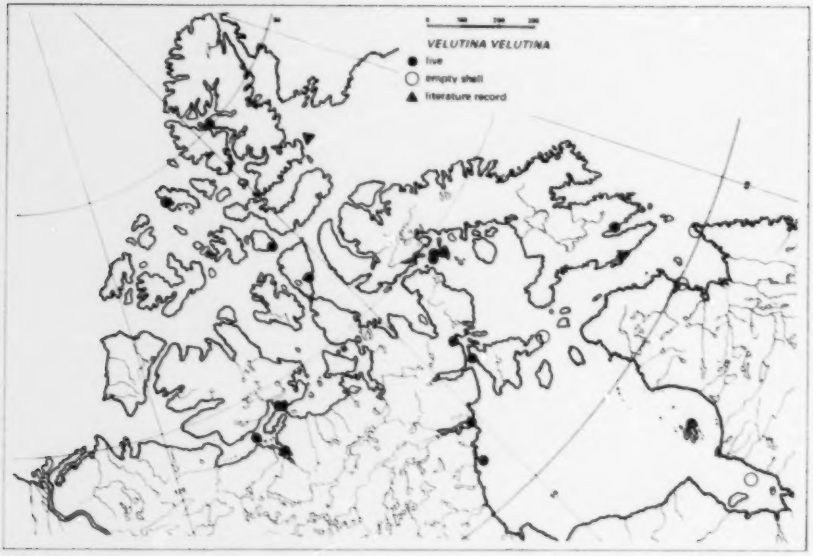
Also recorded from Cape Hatteras, eastern Canada, West Greenland, East Greenland to British Isles, Portugal to Norway, Svalbard, Franz Joseph Islands, Soviet Arctic to Bering Sea, and Aleutians (Thorson 1944). Depths from 0 (Norway) (Thorson 1944) to 120 m (Dease Strait) (this study).

ONCHIDIOPSIS Bergh, 1853
Type species (by monotypy):
Lamellaria glacialis [=*Onchidiopsis groenlandica* Bergh]

ONCHIDIOPSIS GLACIALIS (M. Sars)
Plate II, fig. 14a, b. Map 23.

Lamellaria glacialis M. Sars 1851: 185.
Type locality: Hemmerfest to Havösond, Norway.

Onchidiopsis groenlandica Bergh, 1853: 346, pl. 2.



Map 22

The above synonymy was taken from Thorson (1944: 66), who was quoting from a manuscript given him by Ad. S. Jensen.

Description of specimens

The two specimens were dried up and hard when received. They were somewhat softened by immersion in a saturated solution of trisodium phosphate, but remained contracted (18 mm long), and bright brown. The shell of one is of coriaceous material, thin, broad, and translucent. The notaeum has a wrinkled or 'brain-like' appearance. The tentacles are narrow at their bases, become broader toward the middle, and taper slightly to points at the ends. The foot in both specimens is longer than it is wide. The penis in one specimen has a relatively long, narrow cylindrical end portion, which is turned back on a broader and shorter base.

This species is best recognized by its wide shell, long foot and by the elongate turned-back distal portion of its penis.

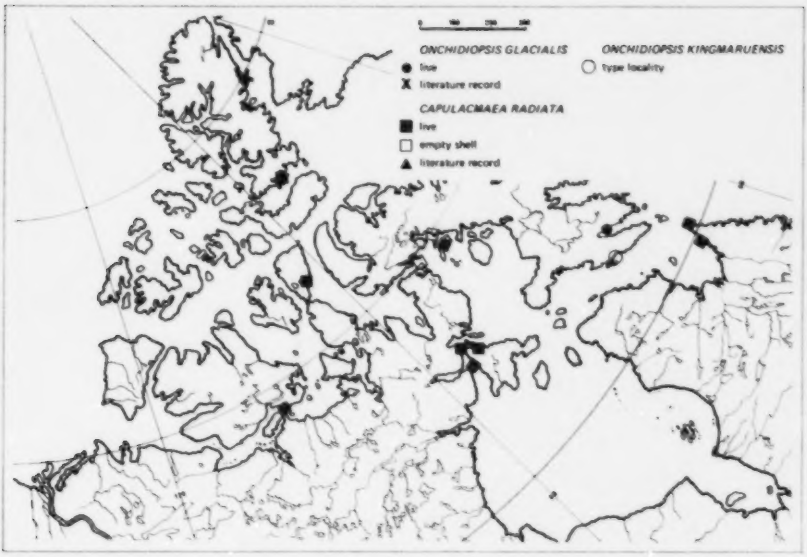
Origin of specimens

Northeast region:
Frobisher Bay–Becher Peninsula (2). Specimens were collected alive on sand at a depth of less than 4 m.

Canadian Arctic literature records

The records from Jones Sound (Grieg 1909: 26, as *Onchidiopsis groenlandica*) and Franklin Pierce Bay [Kane Basin] (Smith 1877: 140 and 1878: 229, as *Onchidiopsis groenlandica*) may both be of this species.

Also recorded from West Greenland, East Greenland, Iceland, Svalbard, and Murman Coast to Novaya Zemlya (Thorson 1944); Arctic Ocean off New Siberian Islands (Gorbunov 1946); Point Barrow, Alaska (MacGinitie 1959). Depths from about 4 m (Frobisher Bay) (this study) to 113 m (West Greenland) (Thorson 1944).



Map 23

ONCHIDIOPSIS KINGMARUENSIS Russell
Map 23.

Onchidiopsis kingmaruensis Russell, 1942: 50, Figs. 1-9.
Type locality: Lake Harbour Fiord, Baffin Island.

This species was described from a single specimen collected and cited by Oughton (1940). No other specimens are known. It is recognized by the thin narrow shell and the ruffled edge of the foot.

CAPULACMAEA M. Sars, 1859
Type species (by monotypy):
Capulus radiatus M. Sars

CAPULACMAEA RADIATA (M. Sars)
Plate III, fig. 4, 7. Map 23.

Pilidium commodum Middendorff, 1849: 99; *nomen nudum.*

Pilidium commodum Middendorff, 1851: 52, pl. 17: 4-11.

Capulus radiatus M. Sars, 1851: 184.
Type locality: Komagfjord [Norway].

Description of specimens

The shell is extremely thin, up to 28 mm in diameter, and white. Some specimens have a pattern of faint radiating brown lines and spots on a white ground. The limpet-shaped shell has a small acentric apex with a turned-over tip. Concentric lines are the only sculpture. There is a thin, pale yellow periostracum.

The shell of this species is recognized by its thin shell, cap shape, and radiating pattern (when present).

Origin of specimens

Southeast region:
Hudson Strait–Button Island (1); Ungava Bay–northeast (3); Roes Welcome Sound (4); Repulse Bay (2); Frozen Strait (1).

Northwest region:
Dease Strait (4).

Northeast region:
Cumberland Sound–Pangnirtung (1); Foxe Basin–north (7); Fury and Hecla Strait (4); Prince Regent Inlet–Creswell Bay (2).

Specimens were collected alive on sand and rock in hauls from depths of 15-40 m, and 90-100 m.

Canadian Arctic literature records

North coast of Jones Sound (Grieg 1909: 25).

Also recorded from Le Have Bank [Nova Scotia], East Greenland, Iceland, Svalbard, Finmark, Kara Sea, Bering Sea, and Sea of Okhotsk (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 22 to 820 m (Golikov 1964).

Naticidae

ACRYBIA H. and A. Adams, 1853
Type species (by monotypy):
Natica flava Gould

ACRYBIA GLACIALIS Thorson
Map 24.

Acrybia glacialis Thorson, 1951: 23, fig. 5.
Type locality: "Jones Sound, between North Devon and Ellesmerland (75°54'N. 81°01'W.)."

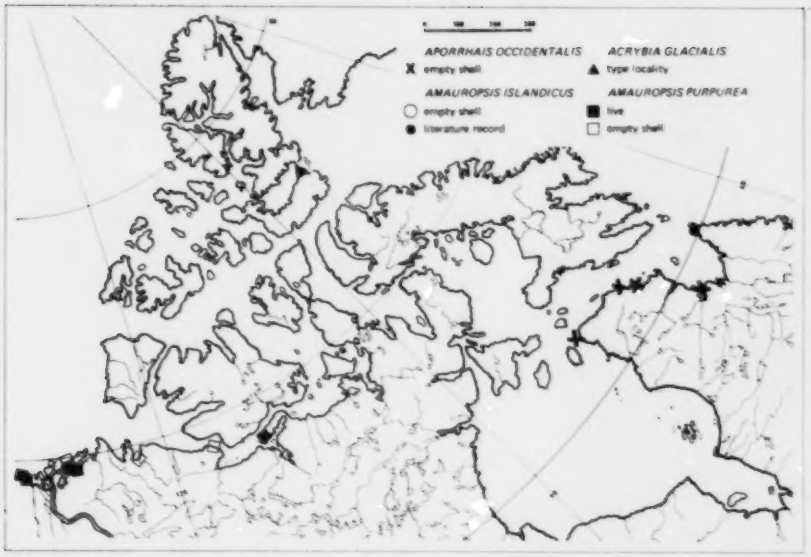
This species is known only from one female specimen collected alive at a depth of 610 m at the type locality. The shell is recognized by its flattened spire, delicate columella, rather oblong aperture, and lack of umbilicus.

AMAUROPSIS Mörch, 1857
Type species (by subsequent designation, Dall 1909):
Natica helicoides Johnson [=*Nerita islandica* Gmelin]

AMAUROPSIS ISLANDICA (Gmelin)
Plate III, fig. 11. Map 24.

Nerita islandica Gmelin, 1791: 3675, names Müller's species No. 2955 (1776: 244).
Type locality: "Oceano Septentrionalis."

For synonyms, see Dautzenburg and Fischer (1912: 247).



Map 24

Description of specimen

The shell of a young *Amauropsis*, probably of this species, is thin, rather elongate, 9.5 mm long, and white. Its 3 whorls have grooved sutures. There are no spiral lines. The umbilicus is a small narrow chink. There is a pale olive periostracum.

The shell of this species is distinguished from that of *A. purpurea* by its pale colour, thinner shell, and more elongate shape. It is best distinguished from that of *Lunatia pallida* by its grooved sutures.

Origin of specimen

North region:
Crozier Channel–Mould Bay (1).

The specimen was collected dead.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Whiteaves 1885: 60DD).

Also recorded from Massachusetts to Newfoundland, West Greenland, East Greenland, Iceland to British Isles, Belgium to Norway, Svalbard, Soviet Arctic to Bering Sea from 10 m (East Greenland) to 1267 m (Newfoundland) (Thorson 1944).

AMAUROPSIS PURPUREA Dall

Plate III, fig. 10. Map 24.

Amauropsis purpurea Dall, 1871: 124, pl. 15: 16. Type locality: St. Michael's Norton Sound, Alaska.

This might well be a subspecies or even a synonym of *A. islandicus*. It is, however, beyond the scope of this work to determine their relationship.

Description of specimens

The shell is thin, medium-sized (up to 22 mm in diameter and 34 mm high), and light yellow, reddish brown, or purplish brown. One colour may fade into another, or there may be longitudinal bands of darker colour. Four to 5 rounded whorls enlarge rapidly from a pointed apex. The sutures are grooved. Fine growth lines are crossed by closely spaced spiral threads. The wide aperture is about $^2/_3$ the height of the shell. The outer lip is thin, and the inner lip is slightly everted at the base. The callus is thin and narrow. The umbilicus is a slightly open slit in most specimens. The operculum is horny and light reddish brown. The thin, brownish periostracum is worn off most specimens.

The colour and more globose shape best distinguish the shell of this species from that of *A. islandicus* and the grooved sutures differentiate it from that of *Lunatia pallida*.

Origin of specimens

Northwest region:
Bathurst Inlet (1); Dolphin and Union Strait (5); Darnley Bay (2); Liverpool Bay (ca. 30); Beaufort Sea–Warren Point (ca. 50); Mackenzie Bay (6), King Point Harbour (2), Herschel Island (1).

Specimens were collected alive on mud, sand, and rock at depths of from 6.5 m to 55 m.

Canadian Arctic literature records

Bernard Harbour, Dolphin and Union Strait* (Dall 1919a: 14A, 15A).

Also recorded from Point Barrow, Alaska, south to Nunivak Island, Bering Sea (Oldroyd 1927). Depths from 6.5 m (Bathurst Inlet) (this study) to 55 m (Liverpool Bay) (this study).

NATICA Scopoli, 1777
Type species (by subsequent designation, Harris 1897):
Nerita vitellus Linnaeus

NATICA CLAUSA Broderip and Sowerby
Plate III, fig. 9. Map 25.

Nerita affinis Gmelin, 1791: 3675, names Müller's species No. 2956 (1776: 245); *nomen dubium*.

Natica clausa Broderip and Sowerby, 1829: 372.
Type locality: not specified.

Natica consolidata Couthouy, 1838: 89, pl. 3: 14.

Natica septentrionalis Möller, 1842: 7.

Map 25

Description of specimens

The shell is variable in thickness and size (up to 37 mm in diameter and 37 mm high). Its colour also varies from pale straw yellow to a deep reddish brown. There are 4 to 5 rapidly enlarging whorls, varying in height, the first few of which form a blunt apex. The body whorl is large and rotund. Except for fine growth lines in all specimens and faint spiral lines in some, the shell is smooth. The large aperture has a thin, smoothly curved outer lip. The lower lip is thickened in many specimens, and the callus is always considerably thickened. The latter varies in extent and position but fills the umbilicus completely. A calcareous operculum quite closes the aperture.

The filled umbilicus and calcareous operculum best distinguish the shell of this species from that of *Lunatia pallida*.

Origin of specimens

Southeast region:
Hudson Strait—Port Burwell (8); Ungava Bay—east (12), west (1); Repulse Bay (3); Frozen Strait (2).

Northeast region:
Hudson Strait—Big Island (1); Foxe Basin—southwest (1), north (2).

North region:
Prince Gustav Adolph Sea—near Isachsen (3).

Northwest region:
Dease Strait (1); Darnley Bay (4); Franklin Bay (10); Prince of Wales Strait (1); Mackenzie Bay (6), near Herschel Island (85).

Specimens were collected alive on mud, sand, and rock at depths of from 5-11 to 100 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Dall 1924*a*: 35A); Hudson Strait (Halkett 1898: 80); Hudson Strait* (Whiteaves 1885: 60DD); southwest Hudson Bay (Pelletier *et al.* 1968: 574); probably west of Devon Island (Reeve 1855: 393, as *Natica septentrionalis*); southwest Jones Sound (Grieg 1909: 26); east Jones Sound (Thorson 1951: 22); Ellef Ringnes Island (latitude 79°N.)* (Dall 1924: 31A, as *Euspira affinis*).

Also recorded from Cape Hatteras, eastern Canada, West Greenland, East Greenland, Ireland, Norway to Portugal, Mediterranean, Svalbard, Soviet Arctic to Bering Sea, Japan, and Vancouver (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 0 (Norway) (Thorson 1944) to 2810 m (Clarke 1962).

LUNATIA Gray, 1847
Type species (by original designation):
Natica ampullaria Sowerby

LUNATIA PALLIDA (Broderip and Sowerby)
Plate III, fig. 8. Map 26.

Natica pallida Broderip and Sowerby, 1829: 372.
Type locality: "Oceano Arctico."

Natica borealis Gray, 1839: 136, pl. 37: 2.

For other possible synonyms see Dautzenburg and Fischer (1912: 234).

Natica pusilla Gould, 1841: 237, fig. 166.

Natica groenlandica Möller, 1842: 7.

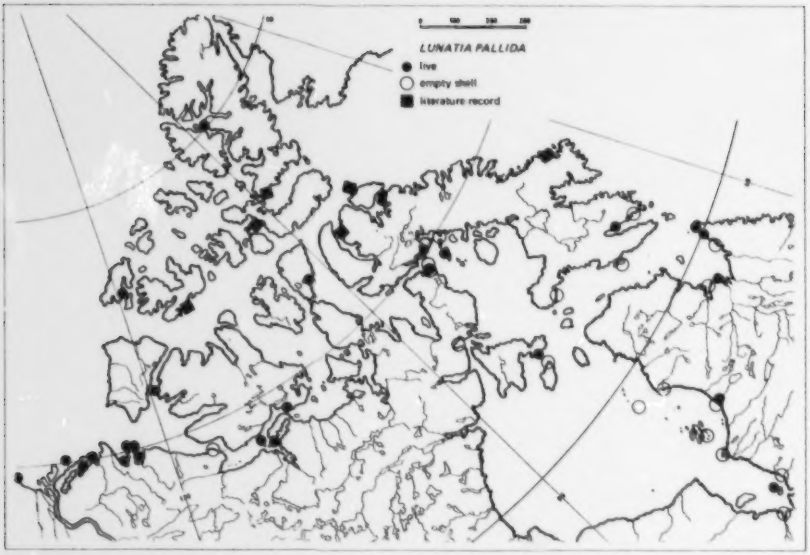
Description of specimens

The shell varies greatly in thickness, size (largest specimen is 35 mm in diameter and 42 mm high), and colour (from pale straw yellow to dark chestnut). There are 4 to 5 rapidly enlarging whorls, giving the shell a rotund appearance. In some specimens, however, the spire is more produced and in other it is more depressed. The shell is smooth except for fine growth lines and, on a few specimens, extremely faint spiral lines. The aperture is long and wide, but variable. The outer lip is thin. The inner part of the lower lip is thicker and, in some specimens, everted. The upper part of the callus is usually wider than the lower part but varies in width and in the extent to which it fills the umbilicus. This is open in all specimens but varies from large and round to extremely narrow and small. There is a chitinous operculum.

The horny operculum and open umbilicus best distinguish the shell of this species from that of *Natica clausa*, and the lack of channelled sutures differentiates it from *Amauropsis* sp.

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (1); Ungava Bay—northeast (6), southwest (2); James Bay—Moosonee (1), Eastmain (4), off Cape Jones (1); Hudson Bay east—Belcher Islands (4), Richmond Gulf (2), near Port Harrison (1), off Ottawa Islands (3); Evans Strait (3); Repulse Bay (2).



Map 26

Northeast region:
Hudson Strait—Big Island (1), Cape Dorset (1); Frobisher Bay—near settlement (1), Countess of Warwick Sound (1); Foxe Basin—north (12); Fury and Hecla Strait (2); Prince Regent Inlet—near Creswell Bay (7); Eclipse Sound—near Pond Inlet (2).

North region:
Crozier Channel—Mould Bay (1).

Northwest region:
Dease Strait (1); Bathurst Inlet—mouth (3); Dolphin and Union Strait (1); Prince of Wales Strait (1); Darnley Bay (4); Amundsen Gulf—off Cape Parry (4); Franklin Bay (11); Liverpool Bay (10); Mackenzie Bay—mouth (7), Herschel Island (16).

Specimens were collected alive on clay, mud, sand, and rock at depths between 2-10 and 90-130 m.

Canadian Arctic literature records

"Upper Savage Island", Hudson Strait* (Whiteaves 1885: 58DD, as *Lunatia groenlandica*); southwest Hudson Bay (Pelletier *et al.* 1968: 574); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 332, as *Natica groenlandica*); Exeter Sound, Baffin Island, and mouth of Lancaster Sound (Thorson 1951: 22); Igloolik, Eclipse Sound*, and Arctic Bay (Ellis 1960: 40), probably west of Devon Island (Reeve 1855: 393, as *Natica groenlandica*); Melville Island (Broderip and Sowerby 1829: 372); Jones Sound (Grieg 1909: 26, as *Natica lunatia groenlandica*); Dolphin and Union Strait* (Dall 1919a: 13A).

Also recorded from Cape Hatteras, Cape Cod to West Greenland, East Greenland to Britain, Belgium to Norway, Svalbard, Franz Joseph Islands, Murman Coast to Novaya Zemlya, and Siberian Arctic Ocean (Thorson 1944); Point Barrow, Alaska, Aleutians, Sea of Okhotsk, Puget Sound to deep water off California (MacGinitie 1959); North Canadian Basin, 800 mi. north of Bering Strait (Clarke 1963). Depths from 0 (Norway) to 2430 m (Cape Hatteras) (Thorson 1944).

Muricidae

BOREOTROPHON P. Fischer, 1884
Type species (by monotypy):
Murex clathratus Linnaeus

BOREOTROPHON CLATHRATUS Linnaeus
Plate III, fig. 15. Map 27.

Murex clathratus Linnaeus, 1767: 1223. Type locality: "In Islandiae Mari."

Fusus lamellosus Gray, 1839: 118, pl. 36: 13.

Fusus scalariformis Gould, 1840: 197.

Dautzenburg and Fischer (1912: 147) give a more complete synonymy of older names.

Description of specimens

The moderately thick shell is up to 37 mm long. One specimen is light tan, and the others are white. There are 5 to 6 more or less shouldered rather inflated whorls, with deep sutures. Sharp, high, axial lamellae (13 to 17 on the body whorl) stand up at the shoulders. There are indistinct and irregular spiral threads. The columella is curved, and the callus is narrow. The aperture is 1/3 to 1/2 the height of the shell and quite narrow. The canal is long and there is an oblong operculum.

The shell of this species is best distinguished from that of *B. truncatus* by its relatively fewer and more shouldered whorls and from that of *B. pacificus* by the fewer lamellae and more shouldered whorls.

Origin of specimens

Southeast region:
Ungava Bay–Keglo Bay (1).

Parry (1).

Northwest region:
Dolphin and Union Strait (2 may be of this species); Amundsen Gulf–off Cape

One specimen was collected alive at a depth of 4.5 m.

Canadian Arctic literature records

Cumberland Sound (Pfeffer 1886a: 43): Dolphin and Union Strait* (Dall 1919a: 16A).

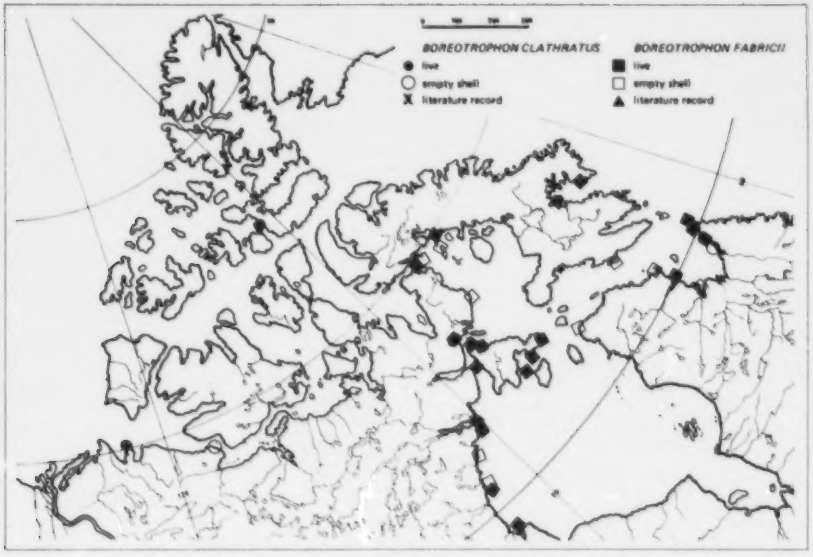
Also recorded from New England to Labrador, West Greenland, East Greenland, Iceland, Faroe Islands, the Hebrides, England, Svalbard, Norway, and Soviet Arctic to Bering Strait (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 4.5 m (Franklin Bay) (this study) to 1033 m (Hebrides) (Thorson 1944).

BOREOTROPHON FABRICII (Möller)
Plate III, fig. 16. Map 27.

Tritonium craticulatum Fabricius, 1780: 400; *non* Linnaeus, 1767 (*Murex*); *nomen oblitum.*

Murex borealis Reeve, 1845, *Murex*, pl. 30: 145.

Trophon fabricii Beck Möller, 1842: 14.
Type locality: probably Greenland.



Map 27

Description of specimens

The shell is very thick, up to 46 mm long, and pure white or dingy white. There are 7 to 8 gradually enlarging whorls with deep sutures and a pointed apex. Up to 13 high, very thin, axial lamellae on the body whorl stand up considerably at the shoulder. In some specimens the lamellae are double. The strong spiral ribs are widely spaced. The columella is curved, and the narrow callus is not in all cases well attached to the shell. The moderately wide aperture is more than ½ the height of the shell. The outer lip is everted in many specimens throughout most of its length until it reaches the canal, which is long, recurved, and very narrow. The operculum is large, ovate, and broadly pointed at its base.

The shell of this species is easily distinguished from other northern *Boreotrophons*, mainly by its large size and distinct spiral ribs.

Origin of specimens

Southeast region:

Hudson Strait—off Port Burwell (4), Diana Bay (4), off Digges Island (5); Ungava Bay—northeast (10), Keglo Bay (5), Payne Bay (8), Leaf Bay (1); Evans Strait (2); Fisher Strait (3); Hudson Bay west—off Churchill (1), Chesterfield Inlet (5); Roes Welcome Sound (2); Repulse Bay (5); Frozen Strait (4).

Northeast region:

Hudson Strait—Big Island (1); Frobisher Bay—near Countess of Warwick Sound (2); Foxe Basin—near Cape Wilson (1), north (3); Fury and Hecla Strait (3).

Specimens were collected alive on mud and rock at depths of from 10 to 128 m.

Canadian Arctic literature records

"Upper Savage Island," Hudson Strait* (Whiteaves 1885: 59DD, as *Trophon craticulatus*); southwest Hudson Bay (Pelletier *et al.* 1968: 574, fig. 12: 5, as

"Boreotrophon clathratus"); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 331).

Also recorded from Gulf of St. Lawrence, Labrador, West Greenland, East Greenland, Iceland, Svalbard, and Bering Sea from 6-8 (East Greenland) to 160 m (Iceland) (Thorson 1944).

BOREOTROPHON PACIFICUS (Dall)

Plate III, fig. 12. Map 28.

Trophon pacificus Dall, 1902: 544.
Type locality: not specified, but range given as Sea Horse Islands, Arctic Ocean to Sitka Harbour, Alaska.

Description of specimens

The shell is moderately thick, up to 28 mm long, and ash colour or purplish. Six to 7 whorls enlarge rather rapidly from a pointed apex. The whorls are so rotund as to appear slightly shouldered. The axial lamellae (17-24 on the body whorl) are narrow but low. Some specimens bear faint spiral lines. The columella is curved, and the callus is rather wide. The wide, oval aperture is almost $^2/_3$ the height of the shell. The canal is very long, narrow, and, in a few specimens, curved. The operculum is ovate, slightly pointed, and incurved at the base.

The shell of this species is best distinguished from that of *B. clathratus* by its more rotund but less shouldered whorls and more numerous lamellae, and from that of *B. truncatus* by the rotund whorls and the longer canal.

Origin of specimens

Northwest region:
Dease Strait (5); Bathurst Inlet–Baychimo Harbour (1); Prince of Wales Strait (3); Mackenzie Bay–Herschel Island (1).

Specimens were collected alive on sand and mud at depths of from 26 to 50 m.

Recorded for the first time from arctic Canada.

Also recorded from Point Barrow, Alaska to Mexico (MacGinitie 1959). Depths from about 9 to 121 m (Dall 1902).

BOREOTROPHON TRUNCATUS (Strøm)

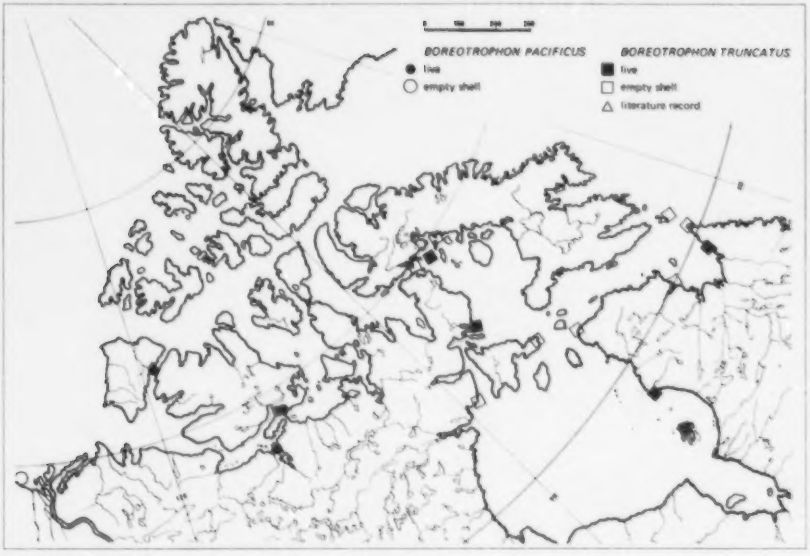
Plate III, fig. 13. Map 28.

Buccinum truncatum Strøm, 1767: 369, pl. 16: 26 (not seen).
Type locality: not specified.

Although this species is considered by Tryon, Jeffreys, and others to be a variety of *Boreotrophon clathratus*, the relationship has not yet been established, so I am treating them separately.

Description of specimens

The shell is moderately thick, up to 27 mm long, and pale chestnut. There are 7 to 8 regularly enlarging whorls with deep sutures. The spire is very sharply pointed. There are 12 to 23 axial lamellae on the body whorl. Spiral lines are fine and irregularly spaced. The columella is very curved. The thick, narrow callus is either white or faintly coloured. The oval aperture is about ½ the height of the shell. In a few specimens the lip is thickened, and in 2 it is slightly everted as well. The canal is narrow, quite long, and slightly recurved. There is a large oval operculum.



Map 28

The shell of this species is best distinguished from that of *B. clathratus* by the relatively greater number of whorls, the higher spire, the wider aperture, and the shorter canal; and from *B. pacificus* by the taller, more straight-sided whorls and the shorter canal.

Origin of specimens

Southeast region:
Hudson Strait–near Port Burwell (5), off Digges Island (1); Ungava Bay–Keglo Bay (1); Hudson Bay east–Belcher Islands (1), near Port Harrison (3); Evans Strait (1); Roes Welcome Sound –Cape Fullerton (4).

Northeast region:
Hudson Strait–Resolution Island (2); Foxe Basin–southwest (1), north (4); Fury and Hecla Strait (1).

Specimens were collected alive on mud, sand, and rock at depths of between 15 and 145-160 m.

Canadian Arctic literature records

Cape Fullerton, Hudson Bay* (Dall 1924*a*: 33A, as *Boreotrophon clathratus*); Cumberland Sound (Dall 1879: 146).

Also recorded from New England to West Greenland, East Greenland, Iceland, Faroe Islands, Great Britain, Denmark, Norway, Svalbard, Murman Coast, Barents Sea and Siberian Ice Sea (Thorson 1944); Arctic Ocean off Franz Joseph and New Siberian Islands (Gorbunov 1946); Point Barrow, Alaska (MacGinitie 1959). Depths from 2 to 950 m (Golikov 1964).

Pyrenidae

ASTYRIS H. and A. Adams, 1853
Type species (by original designation):
Buccinum rosaceum Gould

ASTYRIS ROSACEA(Gould)
Plate II, fig. 15. Map 29.

Buccinum rosaceum Gould, 1840: 197. Type locality: Cohasset, Massachusetts.

Fusus pellucidus Hancock, 1846: 330, pl. 5: 3.

Mangelia holboelli Möller (1842: 12) is probably a synonym.

Description of specimens

The shell is variable in thickness, small (largest specimen is 10 mm long), and pale yellowish or dingy white. There are 6 to 7 whorls with moderately deep sutures and a smooth, rather bulbous apex. The axial sculpture consists of straight, narrow, unevenly spaced ribs varying a little in height. In 2 specimens there are axial ribs on the 2nd and 3rd whorls. Three specimens have strong vertical ribs on the 2nd, 3rd, and 4th whorls and indistinct ones on the 5th. Two specimens bear strong axial ribs on the 2nd to 5th whorls, while the 6th whorl is irregularly and indistinctly ribbed. Low, very regular spiral ribs vary in width from one specimen to the other. They are barely visible in very thin-shelled specimens. The columella is curved in all but 1 specimen. The callus is narrow and barely discernible in some. The aperture is $^1/_3$ the height of the shell and variable in width. There is a short canal. The operculum is thin and roughly shovel-shaped. There is a thin, flaky, straw-coloured periostracum.

The large number of whorls best distinguish the shell of this species from *Buccinum* shells of similar size, and the shape of the aperture and operculum distinguish it from those of turrids.

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (4); Ungava Bay—Adlorilik (1); Fisher Strait —Walrus Island (1).

North region:
Jones Sound—off Coburg Island (1).

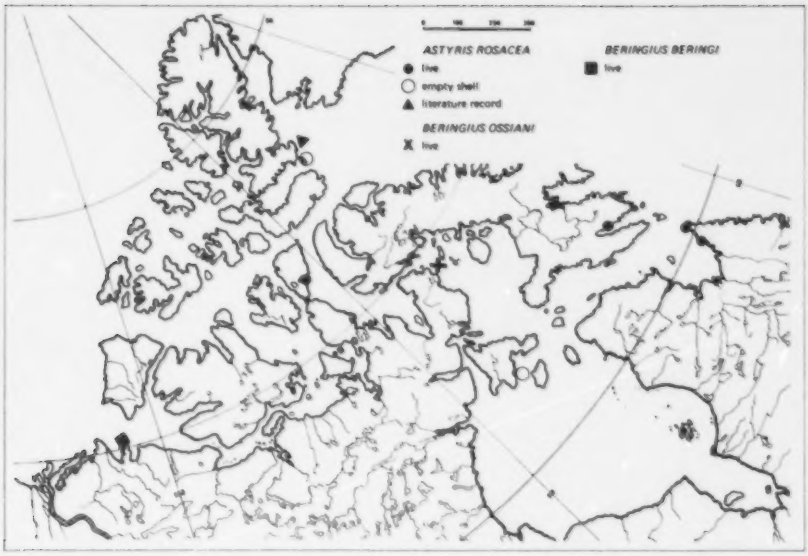
Northeast region:
Frobisher Bay (1); Prince Regent Inlet —Creswell Bay (1).

Specimens were collected alive on mud and rock from hauls from depths of 15-40 and 85-90 m.

Canadian Arctic literature records

"west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 330, as *Fusus pellucidus*); off Ellesmere Island (Thorson 1951: 37).

Also recorded from Cape Cod to Labrador, West Greenland, East Greenland, Faroe Islands, Svalbard, Finmark to Novaya Zemlya, and Bering Sea (Thorson 1944); Arctic Ocean off New Siberian Islands (Gorbunov 1946). Depths from 1 (Svalbard) to 178 m (Cape Cod) (Thorson 1944).



Map 29

Buccinidae

BERINGIUS Dall, 1886

Ruling (4), Opinion 469, of the I.C.Z.N. reads as follows: "The undermentioned generic name is hereby placed on the *Official List of Generic Names in Zoology* with the Name Number 1082: -*Beringius* Dall, 1886 (gender: masculine) (type species, by monotypy: *Chrysodomus crebricostatus* Dall, 1877)." *Beringius* (Dall 1879) and *Jumala* (Friele 1882) are suppressed by the above Opinion.

BERINGIUS BERINGI (Middendorff)
Plate IV, fig. 1. Map 29.

Tritonium (Fusus) behringii Middendorff, 1849: 147, pl. 3: 5,6.
Type locality: St. Paul Island, Bering Sea.

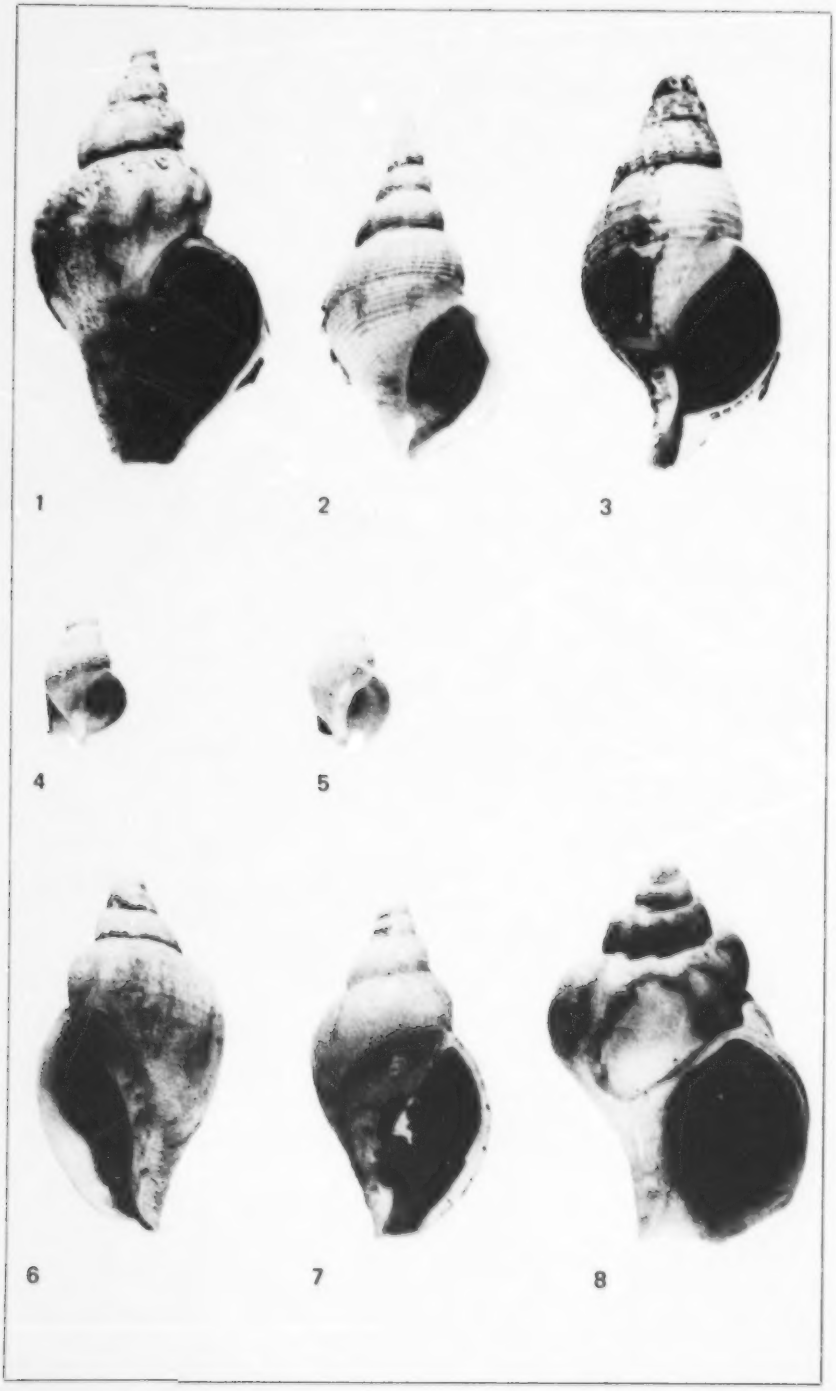
Volutopsius (beringii Middendorff var.?) *kobelti* Dall, 1902: 528, pl. 35: 2.

I am following MacGinitie (1959: 117) in placing this species in the above genus. Middendorff (1851: 224) emended the spelling of the species name.

Description of specimens

The shell is rather thick, large (up to 115 mm long), and a pale purplish tan. There are 7 tumid whorls with deep sutures enlarging regularly from a cylindrical apex of about 3 whorls. The body whorl is about ¾ the height of the shell. Only a few of the weak, curved axial folds extend to the base. Indistinct irregular spiral lines are visible on the inflated part of the last whorls in one specimen; the other has faint but more regular spiral ribs on the early whorls. The columella is nearly straight and

Plate IV



bears near its middle a wide blunt parietal 'tooth'. The callus is narrow. The round aperture is ½ the height of the shell, and the canal is very short and wide. There is a large, dark operculum with a narrow base. A thin, light brown periostracum covers only the later whorls.

The shell of this species is recognized by the short aperture, wide canal and axial folds.

Origin of specimens

Northwest region:

Amundsen Gulf—off Cape Parry (2). Specimens were collected alive on mud at depths of 40-50 m and 173.7 m.

Recorded for the first time from arctic Canada.

Also recorded from Point Barrow, Alaska, to Nunivak Island and Shumagins (MacGinitie 1959). Depths from about 12 (MacGinitie 1959) to 173.7 m (Amundsen Gulf) (this study).

BERINGIUS OSSIANI (Friele)

Plate IV, figs. 2, 4. Map 29.

Neptunea ossiani Friele, 1879: 279 (not seen). Type locality: Svalbard.

Description of specimens

The shell is thin and dingy white. The early 2½ whorls form a cylindrical apex. Friele (1882: 7) says that the adult has 7 to 7½ whorls. The sutures are shallow. In addition to growth lines there are distinct, rounded spiral ribs. The columella is straight, and the callus is very narrow. The aperture is oval, and the canal is rather short. The oval operculum is comparatively large. There is a thin, yellowish, flaky periostracum.

The shell of this species is recognized by its sharp spiral ribs.

Plate IV (all X ½)

Figure

1
BERINGIUS BERINGI
(Middendorff). NMC 36832, Cape Parry, N.W.T., 65

2
BERINGIUS OSSIANI
(Friele). NMC 35155, Scatari Bank, off N.S., 67

3
COLUS ISLANDICUS
(Gmelin). NMC 24014, Foxe Basin, N.W.T., 70

4
BERINGIUS OSSIANI
(Friele). juvenile. NMC 36152, Foxe Basin, N.W.T., 67

5
VOLUTOPSIUS NORVEGICUS
(Gmelin). juvenile. NMC 36155, Foxe Basin, N.W.T., 69

6
VOLUTOPSIUS DEFORMIS
(Reeve). NMC 38537, Darnley Bay, N.W.T., 68

7
VOLUTOPSIUS NORVEGICUS
(Gmelin). NMC 36580, Ross Welcome Sound, N.W.T., 69

8
VOLUTOPSIUS STEFANSSONI
Dall. NMC 35315, Argo Bay, N.W.T., 70

Origin of specimen

Northeast region:

Foxe Basin—south of Tern Island (1 juvenile). The specimen was collected alive on rock at a depth of 92 m.

Recorded for the first time from arctic Canada.

Also recorded from Gulf of St. Lawrence, Newfoundland, West Greenland, East Greenland, southwest of Jan Mayen, east of Iceland, west of Norway, and northwest of Svalbard (Thorson 1944); Arctic Ocean off Franz Joseph Islands (Gorbunov 1946). Depths between 23-28 (East Greenland) and 1447 m (north Greenland Sea) (Golikov 1964).

VOLUTOPSIUS Mörch, 1857
Type species (by original designation):
Strombus norvegicus Gmelin

VOLUTOPSIUS DEFORMIS (Reeve)
Plate IV, fig. 6. Map 30.

Fusus deformis Reeve, 1847: *Fusus*, pl. 12: 45a, b.

Type locality: Svalbard.

Description of specimens

The shell is moderately thick, large (up to 110 mm long), and purplish chestnut to pale tan, the early whorls being, in some specimens, darker than the later ones. There are 5 convex whorls, sinistrally coiled, enlarging rapidly from a blunt apex to an inflated body whorl that is more than ¾ the height of the shell. There are weak axial folds (6 to 7 on the body whorl). Strong growth lines intersect numerous fine spiral threads. The columella is barely curved, and the callus is wide at the top and thickened in a few specimens. The wide aperture is $^2/_3$ the height of the shell. The thick outer lip, slightly excurved at the top, curves smoothly to the short canal. The small brown operculum is wide at the top. There is a thin, brown periostracum.

The sinistral coiling distinguishes the shell of this species from those of other *Volutopsius* species.

Origin of specimens

Northwest region:

Dolphin and Union Strait (1); Darnley Bay (3); Amundsen Gulf—near Cape Parry (6); Franklin Bay (1); Mackenzie Bay—off Herschel Island (1).

Specimens were collected alive on mud and rock at depths of from 4.5 to 68 m.

Canadian Arctic literature records

Dolphin and Union Strait* (Dall 1919a: 14A).

Also recorded from Svalbard (Odhner 1915); White Sea, Kara Sea, and Bering Sea (Krause 1885); Arctic Ocean, off New Siberian Islands (Gorbunov 1946); Point Barrow, Alaska to Aleutians (MacGinitie 1959). Depths from 4.5 m (Franklin Bay) (this study) to 186 m (Dautzenburg and Fischer 1912).

Remarks

The brown alga *Laminaria* (identified by Dr. R. Lee) was found attached to the operculum of a specimen collected alive in Darnley Bay, N.W.T.

Map 30

VOLUTOPSIUS NORVEGICUS (Gmelin)
Plate IV, figs. 5, 7. Map 30.

Strombus norvegicus Gmelin, 1791: 3520. Type locality: Norway.

Fusus largillierti Petit de la Saussaye, 1851: 255, pl. 7: 6.

Description of specimens

The shell is thin, up to about 80 mm long, and pale pinkish chestnut. Five whorls with shallow sutures enlarge rapidly from a large swollen apex. The body whorl is $^2/_3$ the height of the shell. Except for lines of growth and indistinct folds at the suture of 2 specimens, the shell is smooth. Irregular spiral lines are present in 1 specimen. The columella is slightly curved, and there is a very wide wash of callus. The aperture is ½ the height of the shell. The outer lip is slightly everted at the top and curves gradually to a very short, wide canal. The operculum is small and ovate. There are fragments of brown periostracum clinging to a few specimens.

The shell of this species is recognized mainly by its few whorls, thinness, smoothness, and large round apex.

Origin of specimens

Southeast region:
Ungava Bay—Keglo Bay (1); Roes Welcome Sound (1).

Northeast region:
Frobisher Bay—Countess of Warwick Sound (1); Foxe Basin—southwest (1), north (7); Prince Regent Inlet—near Creswell Bay (2).

Specimens were collected alive on mud and clay at depths between 15-40 and 36-45 m.

Recorded for the first time from arctic Canada.

Also recorded from eastern Canada (Whiteaves 1901); West Greenland, East Greenland, Iceland, Jan Mayen to Great Britain, Svalbard, Soviet Arctic to Bering Sea, and Sea of Okhotsk from 15 (East Greenland) to 650 m (Iceland) (Thorson 1944).

VOLUTOPSIUS STEFANSSONI Dall
Plate IV, fig. 8. Map 30.

Volutopsius stefanssoni Dall, 1919*a*: 22A, pl. 1.
Type locality: Point Barrow, Alaska.

This 'species' might well be dextrally coiled *V. deformis*.

Description of specimens

The shell is thick, about 90 mm long, and pinkish brown. Six slightly shouldered whorls enlarge rapidly from a blunt apex. There are 6 indistinct curved axial folds on the body whorl and more on earlier whorls, all of which are crossed by irregular raised spiral lines. The columella is slightly curved. The widely flared aperture is $^2/_3$ the height of the shell. The canal is short and wide.

The shouldered whorls and axial folds best distinguish the shell of this species from that of *V. norvegicus*, and the dextral coiling distinguishes it from that of *V. deformis*.

Origin of specimen

Northwest region:
Amundsen Gulf—spit at Argo Bay (1).

The specimen was collected empty.

Recorded for the first time east of the type locality.

Also recorded from "Point Barrow, south to the 57th parallel" (MacGinitie 1959). Depths from about 12 m (Point Barrow, Alaska) (MacGinitie 1959) to about 103 m (Bering Sea) (Dall 1919*a*).

COLUS Bolten, 1798
Type species (by subsequent designation, Dall 1906):
Murex islandicus Gmelin

COLUS ISLANDICUS (Gmelin)
Plate IV, fig. 3. Map 31.

Fusus islandicus Chemnitz, 1780: 159, pl. 141: 1312 (work not binomial).

Murex islandicus Gmelin, 1791: 3555.
Type locality: Iceland.

Description of specimens

The shell is moderately thick, large (up to 100 mm long), and all white or white with tan markings. There are 6 whorls with deep sutures. The tip of the protoconch is turned down so that the apex appears pointed. The next 2 whorls are equal in size. Strong, well-spaced spiral ribs vary in height and in distance apart. The columella is slightly curved. The callus is narrow, varying in the width at the top. The wide, oval aperture is about ½ the height of the shell. The canal is relatively short and wide. The operculum is variable but elongate in most specimens. The fibrous periostracum is yellowish or reddish brown.

Map 31

The shell of this species is recognized by its large size, pointed apex, and inflated body whorl. A thinner shell, more distant spiral ribs, and more greatly enlarged body whorl differentiate the specimens here described from many specimens examined from north Atlantic waters.

Origin of specimens

Southeast region:
Ungava Bay—Adlorilik (1); Repulse Bay (5).

Northeast region:
Cumberland Sound—Clearwater Fiord (1); Foxe Basin—north (16); Prince Regent Inlet—Creswell Bay (1).

North region:
Barrow Strait—Resolute Bay (1 may be of this species). Specimens were collected alive on mud, sand, and rock at depths of from 51 to 274-284 m.

Canadian Arctic literature records

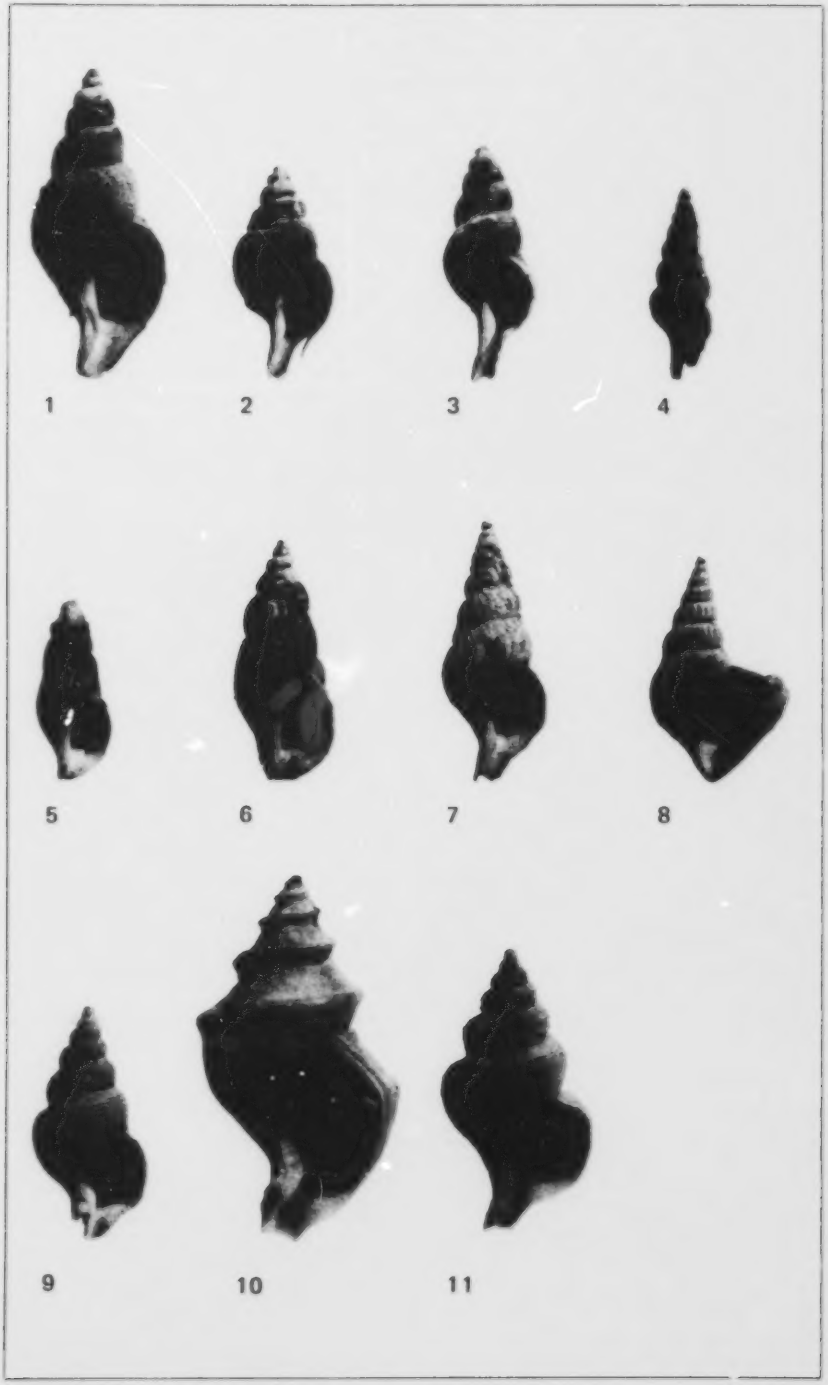
Off Lancaster Sound (Thorson 1951: 51).
Also recorded from Virginia to Massachusetts (Clarke 1954); Gulf of St. Lawrence (Whiteaves 1901); Labrador, West Greenland, East Greenland to Norway, Svalbard, Franz Joseph Islands, Britain, Gulf of Gascogne, and Morocco (Thorson 1944); Soviet Arctic to Bering Sea from 7 m (Bering Sea) (Golikov 1964) to 3006 m (Clarke 1962).

COLUS LACHESIS (Mörch)
Plate V, fig. 4. Map 31.

Fusus lachesis Mörch, 1869: 274.
Type locality: Ikerasak, West Greenland.

Thorson (1951: 52) recorded this species from two Canadian localities:

Plate V



off Lancaster Sound and Jones Sound. He also recorded it from East Greenland, between the Faroe Islands and the Hebrides, southern Svalbard, Franz Joseph Islands, and Norway to the Barents Sea at depths of from 30 (East Greenland) to 900-1040 m (off Iceland) (Thorson 1944). The shell is recognized mainly by the large number (about 10) of rather slowly enlarging whorls and by its relatively small size (41 mm, Mörch 1869).

COLUS PUBESCENS (Verrill)
Plate V, fig. 1. Map 31.

Sipho pubescens Verrill, 1882: 501, pl. 43: 6; pl. 57: 25.
Type locality: not specified, but certainly eastern Canada or New England.

Fusus hirsutus Jeffreys (1883: 396, pl. 44: 7,7a) is probably a synonym.

Plate V (all X ½)

Figure

1
COLUS PUBESCENS
(Verrill). NMC 36181, Foxe Basin, N.W.T., 73

2
COLUS TOGATUS
(Mörch). NMC 36837, Cape Parry, N.W.T., 76

3
COLUS TORTUOSUS
(Reeve). NMC 24095, Foxe Basin, N.W.T., 77

4
COLUS LACHESIS
Mörch. Bergen Museum 20652 Voringen Stat, Norway, 71

5
ANOMALOSIPHO MARTENSI
(Krause). NMC 36537, Herschel Island, Y.T., 78

6
ANOMALOSIPHO cf. VERKRUZENI
(Cobelt). NMC 36570, Mackenzie Bay, N.W.T., 79

7
P.ICIFUSUS KROEYERI
(Möller). NMC 36502, near Herschel Island, N.W.T., 80

8
APORRHAIS OCCIDENTALIS
(Beck). NMC 1674, Hudson Strait, N.W.T., 46

9
COLUS SPITZBERGENSIS
(Reeve). NMC 35481, Ungava Bay, Que., 75

10
NEPTUNEA HEROS
(Gray). NMC 21564, Brock Lagoon, N.W.T., 82

11
NEPTUNEA DESPECTA
(Linnaeus). NMC 12459, Foxe Basin, N.W.T., 82

Description of specimens

The shell is moderately thin, up to 81 mm long, and yellowish or rosy white. There are 6 to 8 whorls with slightly grooved sutures. Growth lines in some specimens are raised. Spiral ribs are of unequal distance apart, quite high, and very variable. In some specimens, stronger ribs alternate with weaker ones. The columella is curved and the callus is clearly defined and narrow. The oval aperture is ½ the height of the shell. The canal is rather short and moderately narrow. There is a narrow and pointed operculum. The light olive-brown periostracum is so covered with dense short bristles that it feels fuzzy.

The shell of this species is best distinguished from that of *C. togatus* by the more rapidly enlarging, less rotund whorls and narrow operculum, and from *C. islandicus* by the smaller size, less inflated whorls, and hairy periostracum.

Origin of specimens

Southeast region:
Hudson Bay east—Ottawa Islands (2), off Belcher Islands (2); Hudson Bay west—off Cape Henrietta Maria (1), south of Chesterfield Inlet (1); Repulse Bay (3).

Northeast region:
Foxe Basin—northwest (4).

Northwest region:
Dease Strait (4); Melville Sound (3); Amundsen Gulf—off Cape Parry (3).

Specimens were collected alive on mud, sand, and rock at depths of from about 95 to 213 m.

Recorded for the first time from arctic Canada.

Also recorded from South Carolina to Nova Scotia (Clarke 1954); Gulf of St. Lawrence (Whiteaves 1901); [probably] Greenland Sea, Barents Sea, Kara Sea, and Laptev Sea (Golikov 1964). Depths from 95 (Repulse Bay) (this study) to 1170 m (off New England) (Verrill 1884).

COLUS ROSEUS (Dall)

Plate II, fig. 16. Map 32.

Chrysodomus roseus Dall, 1877: 7. Type locality: Arctic Ocean.

Description of specimens

The shell is quite thick, up to about 30 mm long, and yellowish white. Six well-rounded whorls enlarge regularly from a smoothly pointed apex. Flat, rather broad spiral ribs are separated by distinct grooves. The columella is curved, and the callus is very narrow. The narrow oval aperture is about ½ the height of the shell. The outer lip is crenulated. The canal is short and quite wide. The operculum is wide at the top.

The small size and more rapidly enlarging whorls distinguish the shell of this species from those of other species of *Colus* in the region.

Origin of specimens

Northwest region:
Mackenzie Bay—near Herschel Island (3).

Specimens were collected alive on mud at depths of from 34 to 36 m.

Recorded for the first time from arctic Canada.

Map 32

Also recorded from off New Siberian Islands (Løyning 1932); Bering Sea (Krause 1885); off Cape Lisburne, Arctic Ocean (Oldroyd 1927). Depths from about 15 m (St. Lorenzbai) (Krause 1885) to 36 m (near Herschel Island) (this study).

COLUS SPITZBERGENSIS (Reeve)
Plate V, fig. 9. Map 32.

Tritonium (Fusus) shantaricum Middendorff, 1849: 146; 1851: pl. 10: 7,8; *nomen oblitum.*

Fusus spitzbergensis Reeve, 1855: 395, pl. 32: 6.

Type locality: Svalbard.

Description of specimens

The shell is thick, up to about 50 mm long, and white with pinkish-brown areas. Eight to 9 evenly rounded whorls with deep sutures enlarge gradually from a blunt apex. On some specimens, the last whorl appears to have a slight shoulder. The dense spiral ribs are strong, wide, low, and equidistant. The columella is curved, and the callus is very narrow. The aperture is less than ½ the height of the shell. The outer lip is flattened at the top and side, imparting an oblong appearance to that part of the aperture. There is a short narrow canal, which is recurved at the base in 1 specimen. The inside of the outer lip is grooved to correspond with the external spiral ribs. The oval operculum has a pointed base. A few flakes of thin, straw-coloured periostracum adhere to the shell.

The shell of this species is recognized by its thickness, shape, strong spiral sculpture, and relatively short canal.

Origin of specimens

Southeast region:

Hudson Strait—near Port Burwell (4); Ungava Bay—Keglo Bay (1), Leaf Bay (1).

A specimen was collected alive on rock at a depth of 128 m.

Canadian Arctic literature records

Fort Chimo, Ungava Bay (Dall 1887: 205); Hudson Strait (Allen 1965: 991).

Also recorded from Maine to Labrador, Point Barrow, Alaska to Juan de Fuca Strait, Washington (MacGinitie 1959); and Bering Sea (Middendorff 1849). Depths from 2 to 548 m (LaRocque 1953).

COLUS TOGATUS (Mörch)
Plate V, fig. 2. Map 33.

Fusus ebur var. *togata* Mörch, 1869: 275.
Type locality: Greenland.

Fusus (Siphonorbis) togatus Mörch, 1869*b*: 398.

This species is called by many authors (e.g. Friele 1882) *Sipho curtus* Jeffreys. Jeffreys' (1867: 336) description is inadequate and the name should not be used.

Description of specimens

The shell is very thin, up to 60 mm long, and white. Five to 6 rounded whorls with shallow sutures enlarge gradually from a rather pointed apex. The spiral ribs are usually low, rounded, more or less evenly spaced, and with a few exceptions, close together. In some specimens, stronger ribs alternate with weaker ones. The columella is curved in most specimens but varies; the callus is thin and narrow. The oval aperture is a little more than ½ the height of the shell. The canal varies greatly in length and width, and is either nearly straight or somewhat recurved. The operculum is wider at the top, but its narrower base is blunt. Its colour varies from yellow to dark brown. The periostracum is very thin, adheres well, and is either pale yellow or pale olive brown. In a few specimens, it bears short, well spaced bristles.

The thinner shell, the more rotund whorls, the wider canal, and the wider, blunter, operculum best distinguish the shell of this species from that of *C. tortuosus* and the thin periostracum, the more rotund whorls and the wider operculum from that of *C. pubescens*.

Origin of specimens

North region:

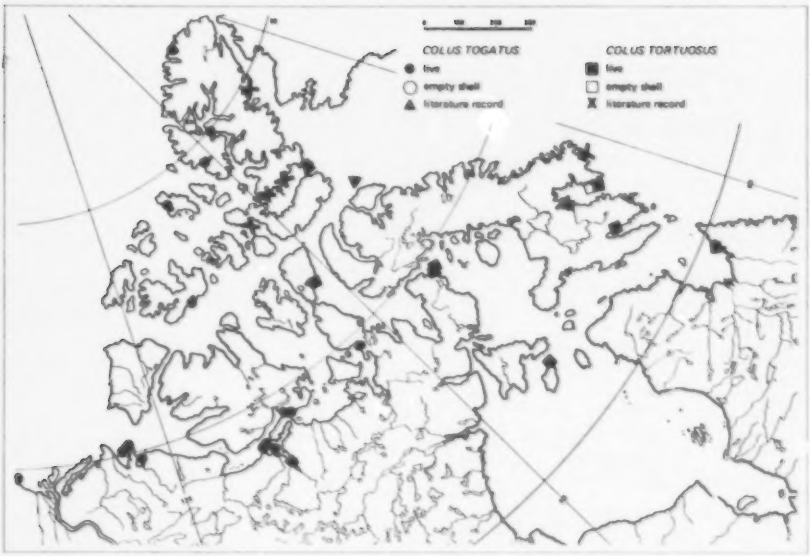
Viscount Melville Sound—near Winter Harbour (ca. 25); Prince Gustav Adolph Sea—Isachsen (23); Nansen Sound (1); Eureka Sound—Slidre Fiord (4); Arctic Ocean—Disraeli Bay (4).

Baychimo Harbour (ca. 50); Melville Sound (ca. 32); Darnley Bay (12); Amundsen Gulf—near Cape Parry (ca. 25); Franklin Bay (ca. 40); Mackenzie Bay—off Herschel Island (3).

Northwest region:

James Ross Strait—Spence Bay (ca. 20); Dease Strait (ca. 20); Bathurst Inlet—

Specimens were collected alive on mud, gravel, and rock at depths of from 4.5 to 230 m.



Map 33

Canadian Arctic literature records

Off Lancaster Sound and Jones Sound (Thorson 1951: 49); Winter Harbour, Melville Island* (Dall 1924: 31A, as *Colus (Aulacofusus) sabinii*) may be of this species.

Also recorded from North Atlantic, West Greenland, East Greenland, Iceland, Svalbard to Finmark, and Murman Coast to Novaya Zemlya (Thorson 1944); Arctic Ocean, off Franz Joseph Islands and New Siberian Islands (Gorbunov 1946); Siberian Ice Sea (Løyning 1932). Depths from 4.5 m (Franklin Bay) (this study) to 1230 m (between Bear Island and Finmark) (Thorson 1944).

COLUS TORTUOSUS (Reeve)
Plate V, fig. 3. Map 33.

Fusus tortuosus Reeve, 1855: 394, pl. 32: 5a, b.

This may be *Buccinum sabinii* Gray, which appears to be a *nomen dubium*.

Type locality: not specified.

Description of specimens

The shell varies in thickness but is never extremely thin. It is up to 58 mm long and white. There are 6 to 7 whorls with rather shallow sutures and a blunt apex. Many specimens have the characteristic sloping shoulder below the suture, especially on the last whorl. Fine growth lines cross strong, rounded, irregularly spaced spiral ribs that vary in height and distance apart from one specimen to another. In a few specimens, they are close, broad and low, but in most, they are quite widely spaced. Between the ribs are numerous spiral lines. The columella is quite curved, and the callus is narrow. The small oval aperture is ½ the height of the shell. The canal is

long and narrow, becoming wider at the excurved base. The operculum is dark, narrow, and pointed. There is a pale olive, reddish brown, or olive brown periostracum.

The sloping shoulder of the body whorl and the narrow operculum best distinguish the shell of this species from that of *C. togatus*.

Origin of specimens

Southeast region:
Ungava Bay—Keglo Bay (1); Evans Strait (2).

Foxe Basin—north (3); Prince Regent Inlet—Creswell Bay (3).

Northeast region:
Frobisher Bay—near settlement (3), near Countess of Warwick Sound (4);

Specimens were collected alive on clay, mud, and rock at depths of between 15-27 and 144-198 m.

Canadian Arctic literature records

"west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 330, as *Fusus sabini*); Exeter Sound, Baffin Island (Thorson 1951: 53, as *Sipho turritus*) probably this species; Jones Sound (Grieg 1909: 29, as *Neptunea siphonorbis turrita*) may be this species; Hayes Sound and Dobbin Bay [Kane Basin] (Smith 1877: 132 and 1878: 224 records doubt). Reeve's type specimen might have come from Wellington Channel.

Also recorded from West Greenland (Walker 1862); East Greenland, Jan Mayen, Svalbard, Murman Coast, Barents Sea, Siberian Ice Sea, and [?] Alaska from 5½-11 (East Greenland) to 1187 m (west of Finmark) (Thorson 1944).

ANOMALOSIPHO Dautzenburg and Fischer
Type species (by original designation):
SIPHO VERKRUZENI Kobelt

ANOMALOSIPHO MARTENSI (Krause)
Plate V, fig. 5. Map 34.

Sipho martensi Krause, 1885: 287, pl. 18: 10.
Type locality: "Metschigmenbai," Bering Sea.

Fusus (Euthria) conulus Aurivillius (1887: 377, pl. 13: 6) may be a synonym.

Description of specimens

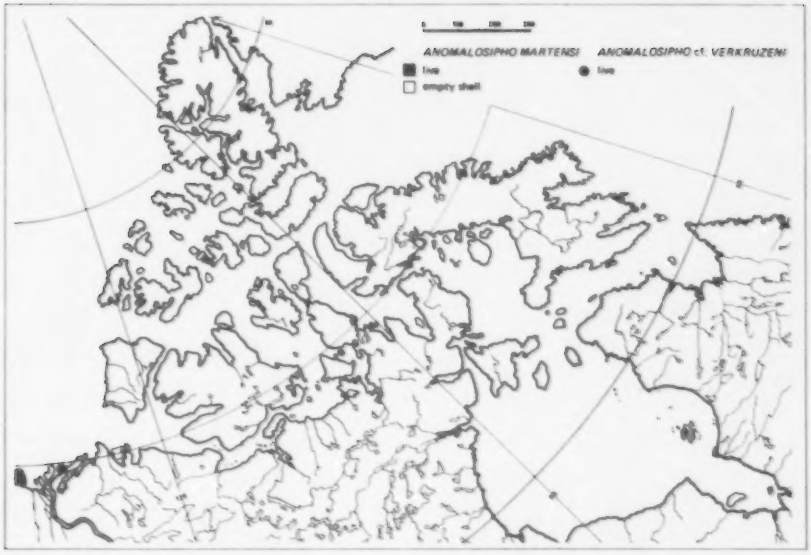
The shell is quite thick, up to about 40 mm long, and white. There are 6 nearly straight-sided whorls with shallow sutures. The apices of all specimens are eroded. The low, narrow, spiral ribs are separated by spaces of varying widths. A few irregular, curved axial lines are prominent on the body whorl. The columella is barely curved, and the callus is moderately narrow. The oval aperture is slightly less than ½ the height of the shell. The canal is short, but variable in length and quite wide. The operculum is ovate, narrow at the top, and barely pointed at the base. There is a thin, yellowish-brown periostracum.

The shell of this species is recognized by its straight-sided whorls and short canal. Its relatively small size best distinguishes it from that of *A. verkruzeni*.

Origin of specimens

Northwest region:
Franklin Bay (1); Mackenzie Bay—near Herschel Island (3).

Specimens were collected alive on mud at a depth of 36 m.



Map 34

Recorded for the first time from arctic Canada.

Also recorded from Point Barrow, Alaska and Plover Bay (MacGinitie 1959). Depths from about 15 m (Metschigmenbai) (Krause 1885) to 55 m (Bering Strait) (Dall 1885).

ANOMALOSIPHO cf. *VERKRUZENI* (Kobelt)
Plate V, fig. 6. Map 34.

Sipho verkrüzeni Kobelt, 1876: 70, pl. 2: 1, 1b.

Type locality: Porsangerfjord, [Norway].

Description of specimens

The shell is thick, up to about 50 mm long, and light greyish brown. There are 7 slowly enlarging, rather straight-sided whorls with shallow sutures. In all specimens, the apex is worn away. On a few shells there are irregular, low axial folds, resembling eroded breaks, mended while the animal was still alive. The spiral ribs are low, nearly regular, and the same width as the interspaces. The straight columella is thickened at the base. The callus is narrow. The narrow oval aperture is less than ⅓ the height of the shell. The outer lip is everted and flared. The canal is short, deep, and wide. The oval operculum has a rounded top and a narrower base. There is a smooth, brownish-yellow periostracum.

The greater size, wider aperture, and slightly more convex whorls distinguish the shell of this species from that of *A. martensi*.

Origin of specimens

Northwest region:
Mackenzie Bay—off Warren Point (2), near Herschel Island (3).

Specimens were collected alive on mud in hauls from depths of 12-37 and 21-44 m.

Recorded for the first time from arctic Canada.

Also recorded from Newfoundland (Dautzenburg and Fischer 1912); Arctic Ocean to Bering Strait (Oldroyd 1927). Depths from 12-37 m (Mackenzie Bay) (this study) to 1267 m (Newfoundland Banks) (Dautzenburg and Fischer 1912).

PLICIFUSUS
Type species (by original designation):
Fusus kroeyeri Möller

PLICIFUSUS KROEYERI (Möller)
Plate V, fig. 7. Map 35.

Fusus kröyeri Möller, 1842: 15.
Type locality: Greenland.

Buccinum cretaceum Reeve, 1846: *Buccinum*, pl. 14: 112.
Plicifusus johansenі Dall, 1919a: 21A, pl. 3.

Description of specimens

The shell is variable in thickness, up to 63 mm long, and white or pale chestnut. Seven to 8 whorls with distinct sutures enlarge slowly from a pointed apex (in 1 specimen, it is blunt). Irregularly oriented, rounded axial ribs are present on each whorl down to the penultimate (on which there are about 16). In about ¼ of the lots, the shells have high longitudinal plicae, even on the body whorl. In about ½ the lots, they have less prominent plicae that are indistinct on the body whorl. The remaining shells have ribs that are only barely visible, even on the early whorls. Fine and deeply incised spiral lines form flat threads that are broader and stronger near the base of the body whorl. The columella is curved, but is variable. The aperture is less than ½ the height of the shell. It is quite narrow, and ovate in most cases, but appears rather squarish when the outer lip is flared at the top in a few large adults. The canal, never very long, is variable. The operculum is distinctly pointed. The thin, yellowish periostracum is worn off most shells.

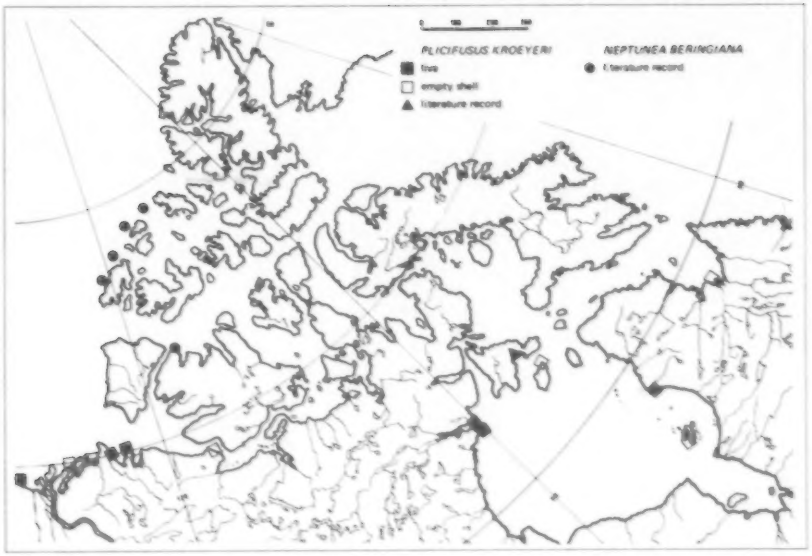
The shell of this species is recognized by the number and appearance of the axial ribs on the penultimate whorl. In addition, the longer canal distinguishes it from the shell of young *Aporrhais occidentalis labradorensis*.

Origin of specimens

Southeast region:
Ungava Bay—south (2); Hudson Bay east—Belcher Islands (1), near Port Harrison (1); Evans Strait (1); Hudson Bay west—near Chesterfield Inlet (2).

Northwest region:
Dolphin and Union Strait (1); Darnley Bay (1); Amundsen Gulf—off Cape Parry (2); Franklin Bay (1); Liverpool Bay (5); Mackenzie Bay—Herschel Island (9).

Specimens were collected alive on mud and rock at depths of between 5-10 and 144-198 m.



Map 35

Canadian Arctic literature records

Northeast, northwest, and southwest Hudson Bay (Pelletier *et al.* 1968: 575); Southampton Island (Brooks 1935: 2); Dolphin and Union Strait* (Dall 1919*a*: 14A).

Also recorded from Newfoundland to Labrador, West Greenland, East Greenland, Svalbard, Murman Coast, Kolquew, Siberian Ice Sea, and Bering Sea (Thorson 1944); north Laptev Sea (Gorbunov 1946); Japan Sea, British Columbia, and Point Barrow, Alaska (MacGinitie 1959). Depths from 0 (Svalbard) (Thorson 1944) to 144-198 m (Evans Strait) (this study).

NEPTUNEA (Bolten) Röding, 1798
Type species (by subsequent designation, Cossmann, 1901): *Murex antiqua* Linnaeus

NEPTUNEA BERINGIANA (Middendorff)
Map 35.

Tritonium (Fusus) antiquum var. *beringiana* Middendorff, 1848: 243 (not seen).

Type locality: Kamtchatka. See Golikov (1963: 166) for synonyms and (1963: pl. 25 and 26) for figures of this species.

Golikov (1963: 168) records this species from the Arctic Ocean off the Sverdrup Islands and north of Victoria Island. He also interprets Dall's (1919*a*) records of *"Chrysodomus solutus"* from Dolphin and Union Strait as being of this species. The specimens referred to by Dall are, however, of *Neptunea heros*.

N. beringiana is recognized mainly by the heavy shell and very rapidly enlarging whorls with sloping shoulders. It is also recorded from Siberian Ice Sea, Bering Sea, Sea of Okhotsk, and Alaska to Aleutians from 1 to 100 m (Golikov 1963).

NEPTUNEA DESPECTA (Linnaeus)
Plate V, fig. 11. Map 36.

Murex despectus Linnaeus, 1758: 754. Type locality: "O. Septentrionali".

The specimens cited below which were collected alive are that form figured by Dautzenburg and Fischer (1912: pl. 2; 8, 9) as *Neptunea despecta tornata* var. *denselirata* Brögger.

Description of specimens

The shell is thin, up to 95 mm long, and pinkish-tan or horn colour. There are 8 convex whorls with deep sutures enlarging very regularly from a rounded apex. Growth lines are distinct and slightly raised in many specimens. There are narrow, irregularly spaced, reddish, spiral ribs, stronger on the early whorls and varying in prominence (about 8 are prominent on the body whorl). The columella is curved, and the callus is narrow. The operculum is large, brown, and ovate with a blunt base. The aperture is less than ½ the height of the shell, a broad oval with a flared and reflexed outer lip. The canal is narrow, curved inward, and slightly wider at the base.

The shell of this species is recognized by the thin shell, smooth rounded whorls, fine ribs, and narrow canal.

Origin of specimens

Southeast region:
Ungava Bay–south (1); James Bay–Charlton Island (1); Evans Strait–near Cape Pembroke (3); Roes Welcome Sound (1).

Northwest region:
Dease Strait (4).

Northeast region:
Frobisher Bay–Countess of Warwick Sound (1); Foxe Basin–northwest (11), north (5); Fury and Hecla Strait (1); Prince Regent Inlet–near Creswell Bay (1).

Specimens were collected alive on clay, mud, and rock at depths of from 30 to 110 m.

Canadian Arctic literature records

Charlton Island, James Bay* (Richards 1936: 540); northwest Hudson Bay (Pelletier *et al.* 1968: 574).

Also recorded from Cape Cod to Labrador, West Greenland, East Greenland, Svalbard, south to Portugal and east through Soviet Arctic to Bering Strait, and Japan (Thorson 1951). Depths from 10 (Denmark) to 1203 m (between Svalbard and Bear Island) (Thorson 1944).

NEPTUNEA HEROS (Gray)
Plate V, fig. 10. Map 36.

Fusus fornicatus Reeve, 1848: *Fusus*, pl. 16: 63; *non* Fabricius, 1780 (see below).

Tritonium (Fusus) antiquum Middendorff, 1849: pl. 5: *non* Linnaeus, 1758 (see below).

Chrysodomus heros Gray, 1850: 15, pl. 7.
Type locality: between the mouth of the Mackenzie River and Cape Parry [N.W.T.]

Map 36

Tritonium fornicatum Fabricius and *Fusus fornicatus* Reeve are both now in the genus *Neptunea*, as are *Murex antiquus* Linnaeus and *Tritonium antiquum* Middendorff.

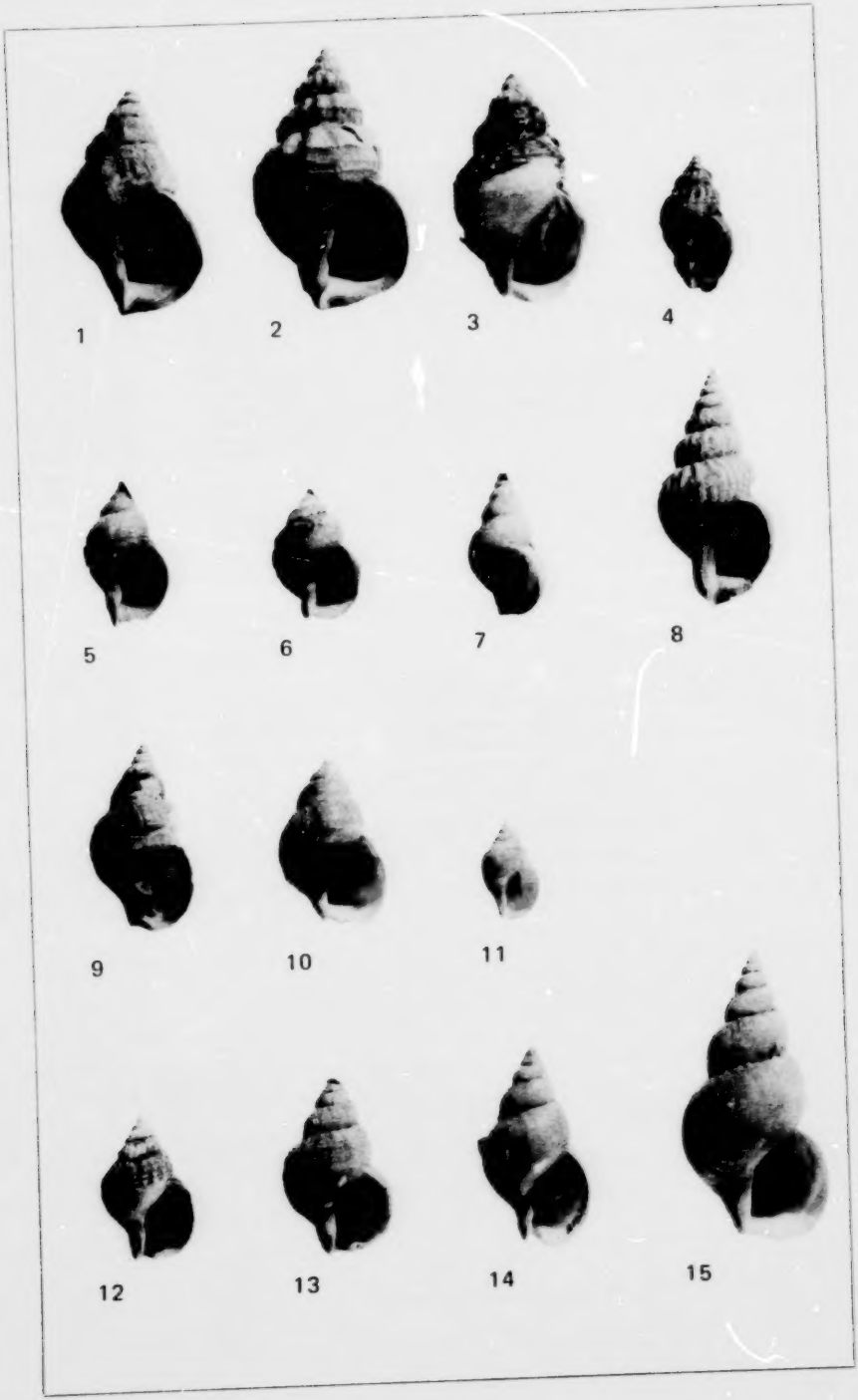
Description of specimens

The shell is very thick, large (up to 115 mm long), and pale pinkish brown. Seven to 8 strongly shouldered whorls enlarge regularly from a pointed apex. Distinct lines of growth are slightly raised in a few specimens. Curved axial folds (about 9 on the body whorl) are weakest on early whorls and usually show as nodules where they meet a strong spiral rib at the edge of the shoulder. This spiral carina is strongest on the early whorls. The body whorl is about $^2/_3$ the height of the shell. The columella varies from straight to moderately curved, and the callus is narrow. The wide aperture is usually oval, but seems almost round in large specimens with a flared outer lip and inflated body whorl. The canal is short, wide, and straight. The dark operculum almost fills the aperture. There is a thin brown periostracum.

The shell of this species is recognized by its thickness and rather straight-sided, tabulate and ridged whorls.

At many of the same localities there are a few specimens that differ from those described above. The shells are thinner and smaller (up to 70 mm) with the same number of whorls. The whorls are more rotund, and their shoulders more sloping. Low but strong spiral ribs are present on the body whorls, which are only ½ the height of the shells. The columellas are more curved, and the canals are narrower. They resemble specimens figured in Golikov (1963: pl. 27 and 28), called by him *Neptunea communis* Middendorff, and recorded from Mackenzie Bay. There are, however, a number of specimens that are referable on the basis of shell characters to both groups contrasted above and that are found at some of the same localities. I am therefore recording them all under one name.

Plate VI



Origin of specimens

Northwest region:
Dolphin and Union Strait (11); Amundsen Gulf—off Cape Parry (1); Franklin Bay (1); Liverpool Bay (20); Mackenzie Bay (1), near Herschel Island (13).

Specimens were collected alive on mud from depths of 4 to 34 m.

Canadian Arctic literature records

Dolphin and Union Strait* (Dall 1919*a*: 14A, 17A as *"Chrysodomus solutus"* and *"Ansistrolepis magnus"*); Mackenzie Bay (Golikov 1963: 164, as *Neptunea satura*).

Also recorded from Svalbard, Soviet Arctic and east to the Alaskan Arctic, Bering Sea and south to Japan (Golikov 1963). Depths from 4 m (Mackenzie Bay) (this study) to 195 m (Barents Sea) (Golikov 1964).

BUCCINUM Linnaeus
Type species (by subsequent designation, Montfort, 1810): *Buccinum undatum* Linnaeus

BUCCINUM ANGULOSUM Gray
Plate VI, fig. 1. Map 37.

Buccinum angulosum Gray, 1839: 127, pl. 36: 6. Type locality: Icy Cape [Alaska].

Plate VI (all X ½)

Figure

1
BUCCINUM ANGULOSUM
Gray. NMC 36779, Prince of Wales Strait, N.W.T., 85

2
BUCCINUM GLACIALE
Linnaeus. NMC 24007, Foxe Basin, N.W.T., 93

3
BUCCINUM POLARE
Gray. NMC 38545, Darnley Bay, N.W.T., 100

4
BUCCINUM CILIATUM
(Fabricius). NMC 24031, Ungava Bay, Que., 88

5
BUCCINUM MOERCHI
Friele. USNM 219308, Cumberland Sound, N.W.T., 98

6
BUCCINUM MALTZANI
Pfeffer. NMC 4288, Bernard Harbour, N.W.T., 96

7
BUCCINUM BELCHERI
Reeve. NMC 35906, Ellef Ringnes Island, N.W.T., 87

8
BUCCINUM TENUE
Gray. NMC 35327, Hudson Bay, N.W.T., 102

9
BUCCINUM CYANEUM
Bruguière. ANSP 305755, Craig Harbour, N.W.T., 89

10
BUCCINUM SERICATUM
Hancock. NMC 36741, Resolute Bay, N.W.T., 101

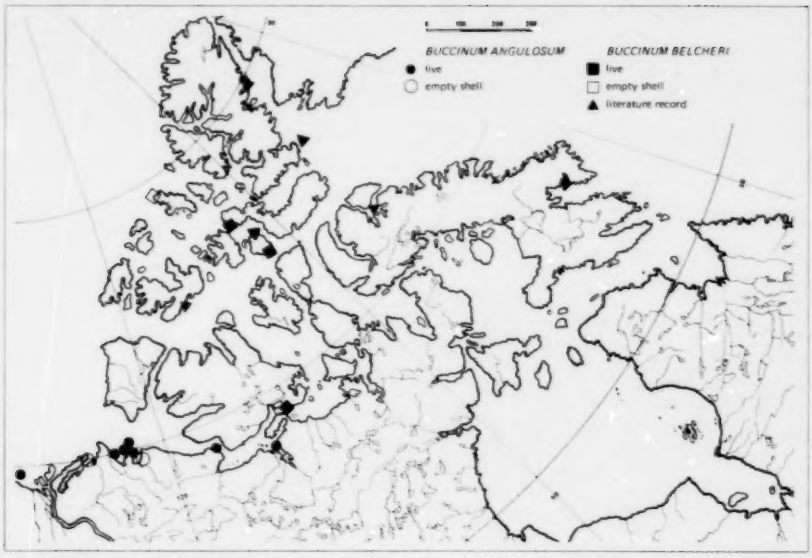
11
BUCCINUM MICROPOMA
Thorson, NMC 36729, Resolute Bay, N.W.T., 97

12
BUCCINUM TOTTENI
Stimpson. NMC 36378, Foxe Basin, N.W.T., 104

13
BUCCINUM UNDATUM
Linnaeus. NMC 36145, Hudson Bay, N.W.T., 105

14
BUCCINUM FINMARKIANUM
Verkrüzen. USNM 219383, Porsanger Fiord, Norway, 91

15
BUCCINUM HYDROPHANUM
Hancock. NMC 36652, Creswell Bay, N.W.T., 95



Map 37

Description of specimens

The shell varies in thickness and size (largest specimen is 63 mm long) and is dingy white or purplish pink. There are 6 to 7 whorls with strongly sloping sides, shallow sutures, and a small apex. About 8 oblique axial folds increase in height from the suture to the widest part of the whorl. At this level there is a spiral ridge on most specimens. The spiral ribs are fine and close and, in a few specimens, are grouped into spiral bands. In some specimens, 1 or more (up to 7) spiral ribs are distinctly stronger than the rest. In a few cases, the folds are so reduced as to be barely visible, and in some, the spiral ridge is missing, while some bear only a mid-whorl carina. There are a few specimens whose whorls do not have the characteristic shape. The columella is slightly curved, and the callus is narrow. The aperture is ½ the height of the shell. The outer lip is slightly everted and flares at the level of the ridge and near the base. The canal is short and wide. The nucleus of the oblong operculum is just outside of centre. There is a pale yellowish, rather thick periostracum, densely covered in short fine bristles.

The hairy periostracum and fine spiral sculpture best distinguish the shell of this species from that of *B. glaciale*; the angular shape, the position of the most prominent spiral rib low on the whorl, and the fewer, more curved axial ribs differentiate it from that of *B. polare*; and its larger size and less rapidly enlarging, less inflated whorls separate it from that of *B. maltzani*.

Origin of specimens

Northwest region:
Dease Strait (2); Dolphin and Union Strait (8); Bathurst Inlet–Baychimo Harbour (3); Darnley Bay (1); Amundsen Gulf–off Cape Parry (9); Franklin Bay (3); Prince of Wales Strait (1); Liverpool Bay (2); Mackenzie Bay–Herschel Island (10).

Specimens were collected alive on mud and rock from depths of 4.5 to 68 m.

Canadian Arctic literature records

Dolphin and Union Strait* (Dall 1919*a*: 14A, 16A).

Also recorded from Svalbard, Murman Coast, Barents Sea, Kara Sea, Siberian Ice Sea, Bering Strait, and Sea of Okhotsk (Odhner 1915); Point Barrow to Kotzebue Sound, Alaska, and Aleutians (MacGinitie 1959). Depths from 4.5 m (Franklin Bay) (this study) to 160-162 m (Barents Sea) (Odhner 1915).

BUCCINUM BELCHERI Reeve
Plate VI, fig. 7. Map 37.

Buccinum belcheri Reeve, 1855: 394, pl. 32: 7a, b. Type locality: Port Refuge [Wellington Channel].

Description of specimens

The shell is very thin, up to 35 mm long, and pale tan. Six to 7 rounded whorls enlarge slowly from a lopsided apex (the first 2 whorls are rather inflated and not quite central). Raised growth lines cross low rounded spiral ribs, which are quite regular and very close. The columella is straight, with one plait faintly visible, and the callus is wide and very thin. The oval aperture is ½ the height of the shell. The nucleus of the small operculum is either central or just below and outside of centre. There is a very thin, pale brown periostracum.

The shell of this species is recognized mainly by its close, low, rounded spiral ribs, and lack of axial folds.

Origin of specimens

North region:
Barrow Strait—Resolute Bay (1); Penny Strait (1); Arctic Ocean—off Cape Isachsen (3).

Northwest region:
Dease Strait—Cambridge Bay (1).

Specimens were collected alive on sand and rock at depths of between 5 and 10-30 m.

Canadian Arctic literature records

Cumberland Sound (Dall 1879: 145); Eclipse Sound, Baffin Island (Ellis 1960: 40); Winter Harbour, Melville Island (Dall 1924: 31A); off Ellesmere Island (Thorson 1951: 41); Dobbin Bay* [Kane Basin] (Smith 1877: 133; 1878: 224).

Also recorded from Labrador and West Greenland (Thorson 1951). Records from East Greenland may be of some other species (Thorson 1951: 41) and also that from Finmark (Smith 1877). Depths from 5 m (Penny Strait) (this study) to 85 m (West Greenland) (Thorson 1951).

Map 38

BUCCINUM CILIATUM (Fabricius)
Plate VI, fig. 4. Map 38.

Tritonium ciliatum Fabricius, 1780: 401.
Type locality: probably Greenland.

For possible synonyms see Dautzenburg and Fischer (1912: 116, 117).

Description of specimens

The shell is moderately thick, small (up to 27 mm long), and yellowish brown or tan. Six and a half whorls enlarge very regularly from a small, rounded apex. The second whorl has fine, distinct spiral ribs. On the remaining whorls about 15 heavy and prominent axial ribs curve somewhat obliquely, extending only part way down the body whorl. In many specimens these are greatly reduced. Over these wind rounded spiral ribs, which are bisected by a line. Between these ribs are narrower ones. Growth lines are distinct and raised in some specimens. The narrow oval aperture is more than ½ the height of the shell. In one specimen, the outer lip is thickened. Low on the straight columella, a twist is visible as a distinct 'tooth'. The callus is narrow. The canal is narrow and relatively long. The nucleus of the small oval operculum is to the outside of centre. There is a thin, yellowish periostracum with bristles along the most prominent growth lines.

The shell of this species is recognized by its small size, small aperture, and toothed columella; it is best distinguished from that of *B. moerchi* by the axial folds, and from that of *B. undatum* by its smaller size and bristled periostracum.

Origin of specimens

Southeast region:
Hudson Strait—near Port Burwell (1), near Digges Island (2); Ungava Bay—south (1); James Bay (2); Hudson Bay east—Belcher Islands (3), off Sleeper Islands (2); Hudson Bay west—Cape Fullerton (2).

North region:
Penny Strait (1 may be of this species).

Northwest region:
Dolphin and Union Strait (3).

Northeast region:
Frobisher Bay—Kneeland Bay (1); Foxe Basin—north (4); Fury and Hecla Strait (1).

Specimens were collected alive on rock at depths of between 12 and 50-53 m.

Canadian Arctic literature records

Cape Fullerton and Southampton Island (Dall 1924*a*: 33A); Cumberland Sound (Dall 1879: 145, as var. *molleri*); Eclipse Sound, Baffin Island (Ellis 1960: 40), Jones Sound (Grieg 1909: 33, as var. *laevior*); Port Kennedy [Gulf of Boothia] (Walker 1862: 70), Dolphin and Union Strait* (Dall 1919*a*: 14A); mouth of Mackenzie River (Stimpson 1865: 374); north of Mackenzie River mouth (MacGinitie 1959: 113). Hancock's (1846: 328) record of *Buccinum cyaneum* Chemnitz from Cumberland Sound may really be of this species.

Also recorded from Gulf of St. Lawrence, Newfoundland, Labrador, West Greenland, southeast Greenland, Jan Mayen, Svalbard, Murman Coast to Bering Strait, Bering Sea, and Alaska (Thorson 1944). Depths from 3-27 m (Novaya Zemlya) (Thorson 1944) and 13 m (Hudson Bay) (this study) to 245 m (southeast Greenland) (Thorson 1944).

BUCCINUM CYANEUM Bruguière
Plate VI, fig. 9. Map 39.

Buccinum novum groenlandicum Chemnitz, 1788: 182, pl. 152: 1448 (work not binomial).

Buccinum cyaneum Bruguière, 1792: 266.
Type locality: Greenland coasts.

Buccinum tenebrosum Hancock, 1846: 327, pl. 5: 1, 2.

Description of specimens

The shell is rather thin, up to 58 mm long, and yellowish, reddish, or purplish brown. Some are quite dark, and a few have a pattern of white or reddish brown. Five to 7 whorls with shallow sutures enlarge regularly from a tiny pointed apex. Faint, oblique, axial folds are visible on the early whorls near the suture in some specimens. On the early whorls are low spiral ribs, usually bisected by a line. On later whorls there are progressively more widely separated spiral ridges. Between these, faint spiral grooves interrupted by growth lines are visible in some specimens. The aperture is ½ the height of the shell. The columella has one twist visible, and the callus is wide, shiny, and often chestnut coloured. The outer lip usually has a shallow sinus at the top, and in a few specimens it curves down before joining the rather deep canal. The large operculum is straight on the inside, rounded on the outside, pointed at top and bottom, and has its nucleus near the outside edge. There is a thin, pale yellow periostracum with short widely spaced bristles.

The shell of this species is distinguished from *B. hydrophanum* by the shorter, rounder whorls, the irregular spiral sculpture, and the position of the nucleus on the outside of the oval operculum. The spiral ridges and the acentric nucleus of the operculum best distinguish the shell from that of *B. moerchi*; the pointed operculum and the less hirsute periostracum, from that of *B. sericatum*; and the lower spire and the pointed operculum with a more eccentric nucleus from that of *B. finmarkianum*.

Origin of specimens

Southeast region:
Ungava Bay—east (6), Payne Bay (1); Hudson Strait—Nottingham Island (1); James Bay—South Twin Island (7), Salt Bay (2); Hudson Bay west—Cape Fullerton (1).

North region:
Penny Strait (2).

Northeast region:
Hudson Strait—Resolution Island (3), Lake Harbour (1), Big Island (1), Cape Dorset (2); Frobisher Bay (3); Kneeland Bay (4); Sylvia Grinnell River (1); Ogac Lake (1); Cumberland Sound—Pangnirtung (1); Davis Strait—Padloping Island (2); Foxe Basin—north (2); Eclipse Sound (1).

Specimens were collected alive on mud and rock at depths of from less than 1 to 40 m.

Canadian Arctic literature records

Labrador's Reef, Ungava Bay (Dall 1887: 206); "Upper Savage Island," Hudson Strait* (Whiteaves 1885: 59D, as *Buccinum groenlandicum* Chem.); northeast Hudson Bay (Pelletier *et al.* 1968: 575); Repulse Bay and Ignertoq, Melville

Map 39

Peninsula and Pond Inlet, Baffin Island (Laurson 1946: 53-55, as *Buccinum groenlandicum* Chem.); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 327, as *Buccinum tenebrosum*); Cumberland Sound (Dall 1879: 146, as *Buccinum groenlandicum* Chem. and *Buccinum tenebrosum* Hanc.); Cumberland Sound (Pfeffer 1886*a*: 25, 26, as *Buccinum grönlandicum* Chem.); [?] Dolphin and Union Strait (Dall 1919*a*: 14A, 15A, 16A).

It is not known to which species the following records refer: Southampton Island, Hudson Bay (Dall 1924*a*: 34A, as *Buccinum cyaneum* Hancock); and Port Kennedy [Gulf of Boothia] (Walker 1862: 70, as *Buccinum cyaneum* Chem.).

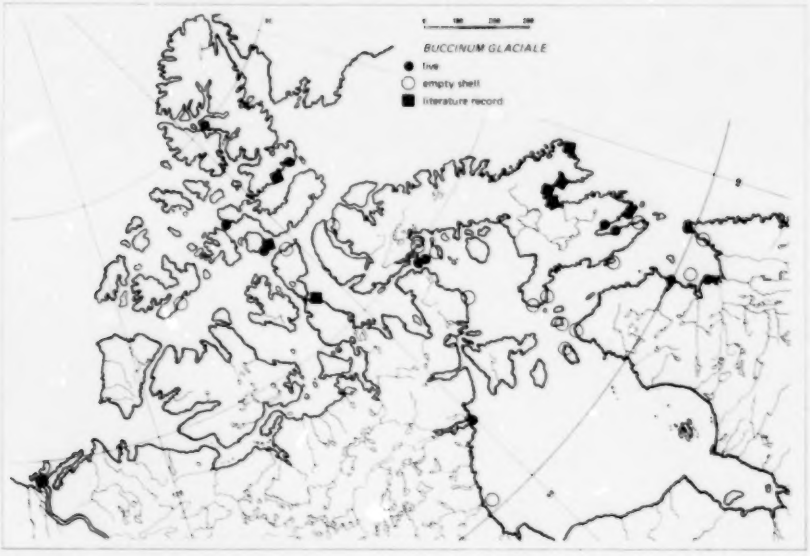
Also recorded from Nova Scotia, Labrador, West Greenland, southeast Greenland, Iceland, Finmark, Svalbard, Soviet Arctic to Bering Strait, Aleutians, and British Columbia. This species does not, however, occur in Pacific waters. Depths from 0 (Pangnirtung Fiord) (this study) also (Norway) (Thorson 1944) to 392 m (Barents Sea) (Thorson 1944).

BUCCINUM FINMARKIANUM Verkrüzen

Plate VI, fig. 14. Map 41.

Buccinum finmarkianum Verkrüzen, 1875: 237, pl. 8: 1-5.
Type locality: Porsanger Fiord [Norway].
Buccinum sarsii Pfeffer, 1886*a*: 40, Fig. 3a, b.

Buccinum tanquaryi Baker (1919: 511, pl. 26: 1,2) is probably a synonym. *Tritonium perdix* Mörch (1877: 438) may also be a synonym. *B. finmarkianum* is considered by some authors to be a variety of *B. cyaneum*.



Map 40

Description of specimens

The shell is up to about 80 mm long and pale chestnut with reddish brown and white markings. There are 7 to 8 rounded whorls with deep sutures, enlarging regularly from a small smooth apex. Raised growth lines cross narrow, close, low, spiral ribs of varying widths and there are low, distinct, axial folds at the sutures of some specimens. There are also spiral ridges (up to about 18 on the body whorl), which are not always parallel to one another. The columella is nearly straight, and the callus is narrow. The aperture, less than ½ the height of the shell, widens toward the base before curving in to the canal. The nucleus of the large oval operculum is outside and below the centre. There is a thin, pale brown periostracum, which is smooth on some specimens and bears very short, close, fine bristles on others.

The close, distinct, spiral ribs and the more circular operculum with a more nearly central nucleus best distinguish the shell of this species from that of *B. cyaneum*; coarser, less regular spiral ribs, higher spire, narrower columellar callus, and acentric nucleus of the operculum, from that of *B. hydrophanum*; and larger oval operculum with a more nearly central nucleus, and higher spire, from that of *B. sericatum*.

Origin of specimens

Southeast region:
Hudson Strait–off Sugluk (1).

Northeast region:
Hudson Strait–Cape Dorset (1); Frobisher Bay–near settlement (9); Cumberland Sound–Pangnirtung (1); Foxe Basin–north (1).

Specimens were collected alive on mud and sand at a depth of 40 m.

Map 41

Canadian Arctic literature records

Kingnait Fiord, Cumberland Sound (Pfeffer 1886*a*: 40, as *Buccinum sarsii*).

Also recorded from Cape Cod to Newfoundland, Gulf of St. Lawrence, West Greenland, East Greenland, Iceland, Jan Mayen, Norway, and Svalbard (Thorson 1944); Murman Coast and Barents Sea (Filatova and Zatsepin 1948). Depths from 5.8 m (East Greenland) to 245 m (southeast Greenland) (Thorson 1944).

BUCCINUM GLACIALE Linnaeus
Plate VI, fig. 2. Map 40.

Buccinum glaciale Linnaeus, 1761: 523. Type locality: Northern Seas.
Buccinum carinatum Phipps, 1774: 197, pl. 13: 2.
Buccinum donovani Gray, 1839: 138.
Buccinum groenlandicum Hancock, 1846: 329, pl. 5: 8, 9.
Tritonium hancocki Mörch, 1857: 84.
Buccinum ekblawi Baker, 1919: 512, pl. 26: 7,8.
Buccinum donovani and *Buccinum hancocki* are probably subspecies of *B. glaciale*. Two-thirds of the specimens considered were referable to *B. g. hancocki*.

Description of specimens

The shells of the above "forms" differ mainly in the shape of the whorls, in the number of carinae on each whorl, and in the strength of the axial folds. *B. glaciale* s.s. has the most conical shape with rather straight-sided, but sloping whorls, and a ridge marking the broadest part of the whorl near its base. These grade into *B. g. donovani* with its inflated whorls and stronger axial folds. *B. g. hancocki* has a thinner shell, more shouldered whorls, and lower axial folds.

The shells examined have in common the following characteristics. They are up to 66 mm long, and pinkish tan. There are 7 to 8 rather slowly enlarging whorls. The nucleus is small, its tip being depressed. Oblique axial folds (12-14 on the body whorl), are more distinct on the early whorls and extend only part way down the body whorl. Spiral bands, variable in height, composed of numerous fine sharp lines, are also most distinct on the early whorls, and in some specimens are barely visible on later whorls. There are between 2 and 8 spiral carinae on each whorl, forming knobs on some specimens where they meet the axial folds. The columella is straight with one twist visible. The callus is narrow. The rather narrow oblong aperture is less than ½ the height of the shell. The outer lip is somewhat thick and usually everted at the top. The canal is long for a *Buccinum*. The rather large operculum is nearly round and has a nearly central nucleus. There is a very thin, smooth, brown periostracum.

The smooth periostracum, the spiral bands and, in many cases, the shape best distinguish the shell of this species from that of *B. angulosum*; and the oblique axial folds differentiate it from *B. polare*.

Origin of specimens

Southeast region:
Hudson Strait—off Port Burwell (3), off Hopes Advance Bay (1), Nottingham Island (1), off Digges Islands (3); Ungava Bay—east (2), south (1), west (3); Hudson Bay east—off Mansel Island (1); Evans Strait (2); Hudson Bay west—between Churchill and Eskimo Point (1), Chesterfield Inlet (5); Repulse Bay (1).

Northeast region:
Hudson Strait—Big Island (1), Cape Dorset (1); Foxe Channel—southeast (1); Frobisher Bay (1), Countess of Warwick Sound (4), Kneeland Bay (3), Jackman Sound (1); Foxe Basin—off Cape Wilson (1), north (8); Fury and Hecla Strait (1); Admiralty Inlet—Arctic Bay (2); Barrow Strait—Garnier Bay (3).

North region:
Barrow Strait—Resolute Bay (7); Penny Strait (2); Viscount Melville Sound—Winter Harbour (1); Jones Sound—Craig Harbour (12); Eureka Sound—Slidre Fiord (9).

Specimens were collected alive on mud, sand, gravel, and rock at depths of from 5 to 119 m.

Canadian Arctic literature records,

Cumberland Sound (Dall 1879: 145); Cumberland Sound (Pfeffer 1886*a*: 30, as *Buccinum hancocki*); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 329, as *Buccinum groenlandicum*); Exeter Sound, Baffin Island (Thorson 1951: 38, as *Buccinum hancocki*); Port Kennedy [Gulf of Boothia] (Walker 1862: 70, as *Buccinum greenlandicum* Hancock); Assistance Bay [Barrow Strait] (Sutherland 1852: cci); [probably west of Devon Island] (Reeve 1855: 394, also as *Buccinum donovani*); Jones Sound (Grieg 1909: 31, as *Buccinum hancocki*, a variety of *Buccinum groenlandicum*); mouth of Mackenzie River (Gray 1850: 14). Halkett's (1898: 80) record from Hudson Strait, as *"Buccinum plectrum"* may be of this species.

Also recorded from Gulf of St. Lawrence, West Greenland, southeast Greenland, Jan Mayen, Svalbard, Soviet Arctic to Bering Sea, and Japan, at depths of from 0 (West Greenland, Svalbard) to 318 m (Murman Coast) (Thorson 1944).

BUCCINUM HYDROPHANUM Hancock

Plate VI, fig. 15. Map 42.

Buccinum hydrophanum Hancock, 1846: 325, pl. 5: 7.
Type locality: "west coast of Davis Strait" (66° 30'N, 68°W).

Description of specimens

The shell is very thin, up to about 70 mm long, and pale purplish brown, pale tan, or light chestnut. Seven to 8 whorls with shallow sutures enlarge gradually from a small apex, which in some specimens has a depressed tip. Narrow, even, and close spiral ribs are higher and more regular on early whorls, becoming barely discernible on the last whorl. On later whorls, a few spiral ribs stand out more strongly than the rest. Growth lines are also very faint. The aperture is ½ the height of the shell. The columella shows one twist and has a very thin, very wide callus, often of a bright colour. The outer lip is thin, smooth, and in very large specimens has a shallow sinus near the top. The nucleus of the small, round operculum is in the centre. There is a very thin, smooth, pale yellow periostracum.

The shell of this species is recognized mainly by its lack of axial sculpture, rather rapidly descending whorls, and round operculum with a central nucleus. The much finer sculpture, the less rapidly enlarging whorls, and the apex with its shorter whorls best distinguish it from that of *B. moerchi*; the shallower sutures, the larger and higher body whorl, and the round operculum differentiate it from that of *B. finmarkianum*.

Origin of specimens

Southeast region:
Hudson Bay east–off Long Island (5), Richmond Gulf (2); Evans Strait (1); Repulse Bay (5); Frozen Strait (1).

North region:
Barrow Strait–Resolute Bay (ca. 55); Viscount Melville Sound–Winter Harbour (22); Crozier Channel–near Mould Bay (ca. 85); Penny Strait (2); Jones Sound–Craig Harbour (9); Prince Gustav Adolf Sea–near Isachsen (19); Arctic Ocean–off Cape Isachsen (1); Eureka Sound–Slidre Fiord (48); Nansen Sound (12).

Northeast region:
Frobisher Bay–Kneeland Bay (4), Victoria Bay (1); Foxe Basin–north (64); Fury and Hecla Strait (1); Prince Regent Inlet–Creswell Bay (ca. 90).

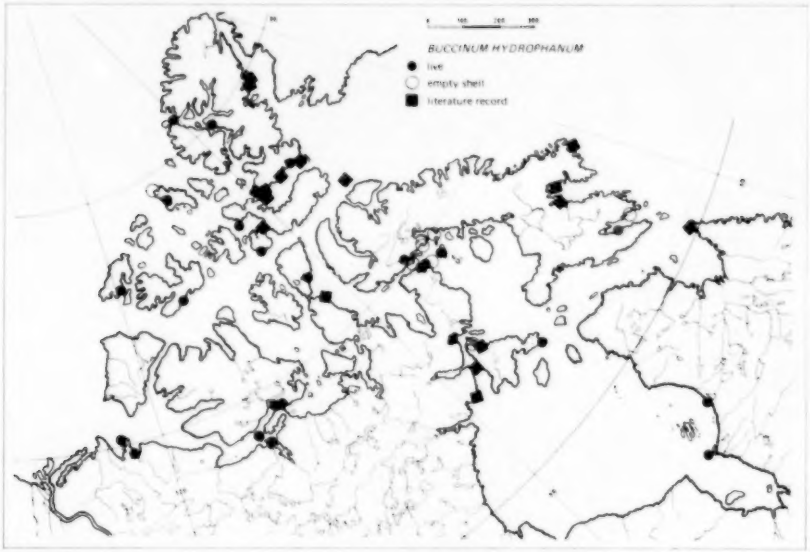
Northwest region:
Dease Strait (20); Bathurst Inlet–near Baychimo Harbour (3); Coronation Gulf (3); Darnley Bay (1); Amundsen Gulf–near Cape Parry (3).

Specimens were collected alive on clay, mud, sand, gravel, and rock from 5 to 230 m.

Canadian Arctic literature records

Cape Fullerton, Hudson Bay, Port Burwell, Hudson Strait, and off Ellef Ringnes Island* (Dall 1924, 1924*a*: 31A, 33A, 35A); northeast Hudson Bay (Pelletier *et al.* 1968: 575); Aivilik, Repulse Bay, Duke of York Bay, Southampton Island, and Roes Welcome Sound (Laurson 1946: 55, 56); Cumberland Sound (Pfeffer 1886*a*: 32); Exeter Sound, Baffin Island, off Lancaster Sound, and Jones Sound (Thorson 1951: 44); Port Kennedy [Gulf of Boothia] (Walker 1852: 70); probably west of Devon Island (Reeve 1885: 394); Jones Sound (Grieg 1909: 32); Franklin Pierce Bay and Dobbin Bay [Kane Basin] (Smith 1876: 133; and 1877: 224).

Also recorded from Newfoundland to West Greenland, East Greenland, Iceland, between Faroe Islands and the Hebrides, Svalbard, Franz Joseph Islands, and Murman Coast to Siberian Ice Sea, at depths of from 3 (Franz Joseph Islands) to 1187 m (Norway) (Thorson 1944).



Map 42

BUCCINUM cf. *MALTZANI* Pfeffer

Plate VI, fig. 6. Map 43.

Buccinum maltzani Pfeffer, 1886: 7, fig. 8: 9a, b.
Type locality: Kara Sea.

This species has been figured by Krause (1892: pl. 15) as *Buccinum ventricosum* Kiener, and by Knipovitsch (1901: pl. 8) as *Buccinum ovum* Middendorff.

Description of specimens

The shell is moderately thin, up to about 30 mm long, and pinkish white. There are 6 rapidly enlarging, rather inflated whorls. Some of the distinct growth lines are raised. Parallel to these are faint folds at the sutures. There are narrow, sharp, slightly waved spiral ribs, close, but varying in strength and distance apart. One plait is visible on the straight columella. There is a very thin wash of callus. The aperture is a little more than ½ the height of the shell. The outer lip either is smoothly curved or has a shallow sinus at the top and curves down before joining at the wide canal. The nucleus of the small oval operculum is in an indented region near the centre. There is a flaky, olive brown periostracum.

The more distinct, sharp ribs, the lack of a hairy periostracum or any hint of angulation, and the smaller relative size best distinguish the shell of this species from that of *B. angulosum;* the sharper sculpture, the smoother periostracum, and the operculum with a more central nucleus distinguish it from *B. cyaneum* and *B. sericatum;* and the sharp wavy sculpture, thicker shell, rapidly enlarging whorls, and wider canal differentiate it from *B. moerchi.*

Map 43

Origin of specimens

Northwest region:
Dease Strait (4); Dolphin and Union Strait (14); Liverpool Bay (6).

Specimens were collected alive on mud and sand in a haul from depths of 2-18 m.

Recorded for the first time from arctic Canada.

Also recorded from East Greenland, Svalbard, Murman Sea, Siberian Ice Sea, and Bering Sea (Odhner 1915). Depths from 2-18 m (Liverpool Bay) (this study) to 107 m (Murman Sea) (Odhner 1915).

BUCCINUM MICROPOMA Thorson
Plate VI, fig. 11. Map 43.

Buccinum micropoma "Ad. Jensen", Thorson, 1944: 100, Fig. 11.

Type locality: "Rosenvinges Bugt, Scoresbysund", East Greenland.

Description of specimens

The shell is very thin, up to 23 mm long, and white. There are 6 rotund whorls with deep sutures and a small apex with a depressed tip. Growth lines are distinct, and the spiral ribs are low, rounded, well spaced and even. In a few specimens, stronger spiral ribs alternate with weaker ones. The columella is slightly curved and bluish. There is a mere wash of callus. The aperture is ½ the height of the shell and narrow at its base. Some specimens have a very dark foot. The operculum is very small and its nucleus is located on the outside of centre. There is a pale yellow periostracum with well-spaced bristles marking the sculpture of the shell.

The shell of this species is best recognized by its small size, lack of axial sculpture, and tiny operculum. The less rapidly enlarging whorls, the heavier shell and sculpture, and the operculum with its nucleus above the base distinguish the shell from that of *B. nivale*; and the straighter-sided whorls, less hirsute periostracum, and smaller operculum distinguish it from that of *B. sericatum*.

Origin of specimens

Southeast region:
Frozen Strait (1).

North region:
Barrow Strait–Resolute Bay (2).

Northwest region:
Prince of Wales Strait (1).

Specimens were collected alive on mud, sand, and rock at depths of between 10-30 m and 38-42 m.

Canadian Arctic literature records

Off Ellesmere Island (Thorson 1944: 102; 1951: 41).

Also recorded from northeast of Newfoundland (National Museum of Canada collection); west of Svalbard from 3-4 m (East Greenland) (Thorson 1944) to 320 m (off Newfoundland) (National Museum of Canada collection).

BUCCINUM MOERCHI Friele

Plate VI, fig. 5. Map 41.

Buccinum mörchi Friele, 1877: 4, fig. 7a.
Type locality: 62°44'N, 1°48'W (off Norway).

This species is possibly that which is figured by Middendorff (1849; pl. 6: 1-3) as *Tritonium (Buccinum) ovum.*

Buccinum frielei Pfeffer, 1886: 5.

Description of specimens

The shell is thin, small (up to 34 mm long), and white or purplish. There are 6 to 7 whorls with deep sutures, especially on the early whorls. The first 2 or 3 whorls have a produced appearance in some specimens. Incised spiral lines divide the surface into low ribs with only a little variation in their width. The columella is white, and one twist may show as a small 'tooth'. In many specimens the wide callus is bluish or purplish. The aperture is more than ½ the height of the shell. The nucleus of the large round operculum is in the centre. There is a pale yellow periostracum with bristles arranged in lines.

The shell of this species is recognized by its relatively small size, elongate apex, banded surface, and round operculum with a central nucleus. The spiral bands and the lack of axial sculpture best distinguish the shell of this species from that of *B. ciliatum*; the smaller size, broader ribs, and slowly descending whorls differentiate it from that of *B. hydrophanum*; the large round operculum, the coarse sculpture, the aperture's narrowness at the base, and the lack of axial sculpture distinguish it from that of *B. maltzani*; and the large, round operculum, and lower sculpture separate it from those of *B. nivale* and *B. micropoma.*

Origin of specimens

Southeast region:
Hudson Strait–off Cape Hopes Advance (1), south end of Nottingham Island (1); Evans Strait (3); Repulse Bay (1).

Northeast region:
Frobisher Bay–Ogac Lake (1), Kneeland Bay (1); Cumberland Sound (2); Foxe Basin–north (1); Prince Regent Inlet–Creswell Bay (1); Baffin Bay–off Cape Christian (1).

North region:
Barrow Strait–Resolute Bay (4); Jones Sound–off Coburg Island (1).

Northwest region:
Dolphin and Union Strait (1); Amundsen Gulf–near Cape Parry (3).

Specimens were collected alive on sand and rock at depths of from 6 to 27 m.

Canadian Arctic literature records

Cumberland Sound* (Dall 1879: 145, as *Buccinum humphreysianum*).

Also recorded from Newfoundland (National Museum of Canada collection); Kara Sea (Pfeffer 1884); perhaps Soviet Arctic to Bering Sea (Middendorff 1849). Depths from 6 m (Resolute Bay) (this study) to 753 m (Norway) (Friele 1877).

BUCCINUM NIVALE Friele

Map 44.

Buccinum nivale Friele, 1882: 32, pl. 3: 24, 25.

Type locality: 68°21'N, 10°40'E [off Norway].

Description of specimens

The shell is extremely thin, up to 24 mm long, and white. Five and a half inflated whorls with distinct sutures enlarge quite rapidly from a small blunt apex. There are very fine raised spiral lines. The columella is straight and thick, with one visible twist, and the callus is very wide. The aperture is $^2/_3$ the height of the shell. The tiny ovate operculum has its nucleus at the base. There is a moderately thick, adherent, yellowish-brown periostracum bearing bristles along lines of growth and spiral ribs.

This species is recognized by its small size, very thin shell, rapidly enlarging whorls, thick, bristled periostracum, and tiny operculum with its nucleus at the base.

Origin of specimens:

Southeast region:
Frozen Strait (1).

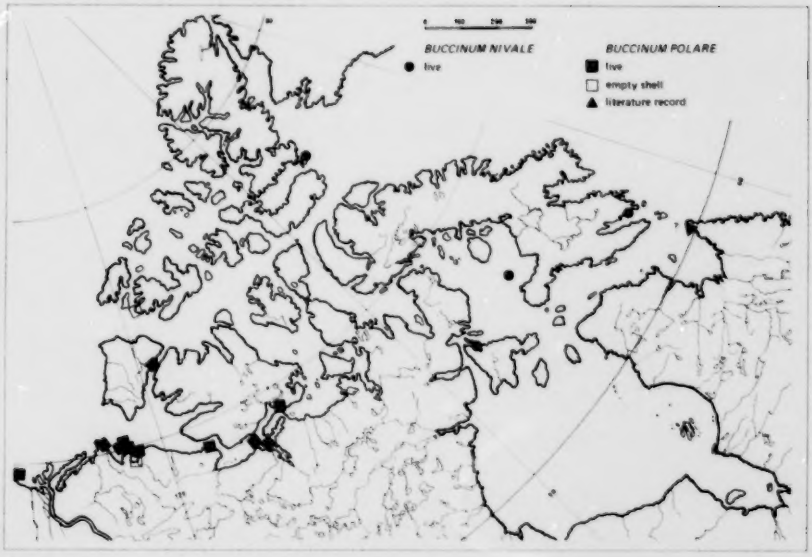
North region:
Jones Sound–Coburg Island (1).

Northeast region:
Frobisher Bay–Countess of Warwick Sound (2); Foxe Basin–centre (1).

Specimens were collected alive on mud, sand, and gravel from depths of 38-42 to 104-137 m.

Recorded for the first time from arctic Canada.

Also recorded from East Greenland (Thorson 1944); Greenland Sea, Svalbard, Barents Sea, and Kara Sea (Golikov 1964). Depths from 38-42 m (Frozen Strait) (this study) to 860 m (west of Lofoten) (Thorson 1944).



Map 44

BUCCINUM PLECTRUM Stimpson
Map 45.

Buccinum plectrum Stimpson, 1865: 374.

Type locality: Arctic Ocean, north of Bering Strait.

This species was recorded by Dall (1919*a*: 14A) from Bernard Harbour, Dolphin and Union Strait, N.W.T. The shell is recognized by its numerous, sigmoid, axial folds, its spiral bands composed of spiral threads, and its lack of carinae. Oldroyd (1927) figures it in Plate 5: 5. It is also recorded from Point Barrow, Alaska to Puget Sound from depths of about 12 to 160 m (MacGinitie 1959). Stimpson (1865) records this species possibly as a fossil from Eastern Canada but it does not now live there.

BUCCINUM POLARE Gray
Plate VI, fig. 3. Map 44.

Buccinum polare Gray, 1839: 128.
Type locality: Icy Cape [Alaska].

Buccinum terranovae "Beck" Mörch, 1869*a*: 14.

Description of specimens

The shell is variable in thickness, up to 67 mm long, and dingy white or purplish pink. There are 7 whorls and a small round apex. In most specimens the whorls are inflated, vertically compressed, and rather shouldered. There are, however, specimens with more straight-sided whorls and no shoulders. Numerous, narrow axial folds, parallel to the distinct growth lines, are strongest at the sutures and extend

down the whorls to differing degrees. There are very fine, nearly equidistant spiral ribs. There are also more prominent ribs (4-13 on the body whorl), which differ in height and distance apart, but the highest one is at the edge of the shoulder. The aperture is about ½ the height of the shell. The columella is nearly straight, with a twist visible in a few specimens. The callus is thin and very narrow. In large specimens, the outer lip has a sinus and is everted at the top. The large oval operculum has a central nucleus. There is a thin, yellowish-brown periostracum with short bristles.

The position of the strongest carina high on the body whorl and the straight axial folds best distinguish the shell of this species from that of *B. angulosum*; the fine spiral sculpture, more convex whorls, and straight axial folds differentiate it from that of *B. glaciale*; and the narrower, more regular spiral ribs, higher spiral carinae, and shallower, narrower, axial folds distinguish it from that of *B. totteni*.

Origin of specimens

North region:
McLure Strait–Cape Russell, Melville Island (1).

Northwest region:
Dease Strait (3); Dolphin and Union Strait (15); Bathurst Inlet–near Baychimo Harbour (23); Coronation Gulf (1); Prince of Wales Strait (7); Darnley Bay (14); Amundsen Gulf–near Cape Parry (12); Franklin Bay (11); Mackenzie Bay –Herschel Island (4).

Specimens were collected alive on mud, sand, gravel, and rock at depths of from 2 to 100 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Dall 1924: 35A); Dolphin and Union Strait (MacGinitie 1959: 108); Dolphin and Union Strait* (Dall 1919*a*: 14A, 16A).

Also recorded from West Greenland, East Greenland, Iceland, Svalbard, Novaya Zemlya, Siberian Ice Sea, and Bering Sea (Thorson 1944); Arctic Ocean, Point Barrow, off New Siberian Islands (Gorbunov 1946); Alaska south to Aleutians, Eastern Siberia, and Kamtchatka (MacGinitie 1959). Depths from 2 m (Prince of Wales Strait) (this study) to about 400-600 m (East Greenland) (Thorson 1944).

BUCCINUM SERICATUM Hancock

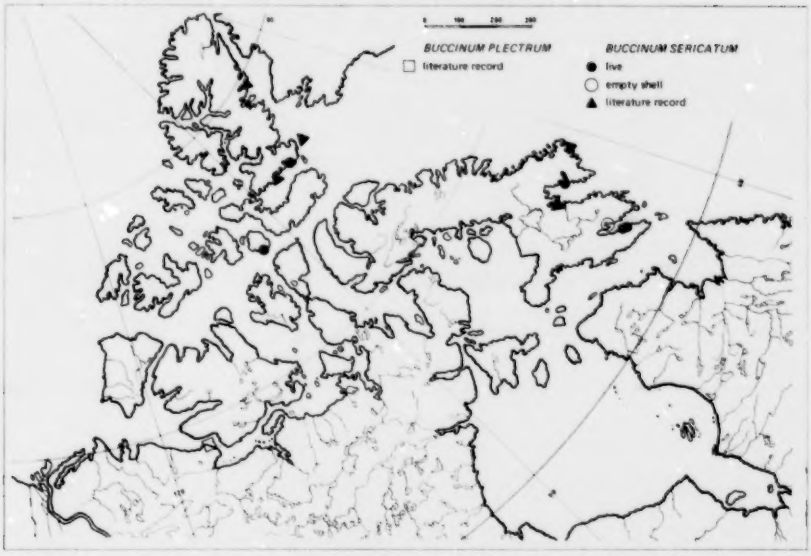
Plate VI, fig. 10. Map 45.

Buccinum sericatum Hancock, 1846: 328, pl. 5: 6.
Type locality: 66°30'N, 68°W [Cumberland Sound].

This species is considered by many authors to be a variety of *Buccinum cyaneum*. As the two forms seem to be sympatric, and are distinguishable, they are treated separately.

Description of specimens

The shell is moderately thin, up to 45 mm long, and rosy or yellowish brown, or white. There are 6 rather inflated whorls with shallow sutures. Distinct growth lines cross low, slightly wavy, spiral ribs that are close but vary in distance apart and in height from one specimen to another. The columella is short and smooth, and the callus is very thin and moderately wide. The aperture is ½ the height of the shell. The outer lip curves out and down below the base before joining the wide shallow canal. The operculum is short and broad and in many specimens bulges on its outer side where the nucleus is situated. The periostracum is light brown and densely covered with very fine, short bristles.



Map 45

The more hirsute periostracum and the irregular, broader operculum distinguish the shell of this species from that of *B. cyaneum*, and the shorter spire and excentric operculum, from *B. finmarkianum*.

Origin of specimens

Northeast region:
Frobisher Bay–Kneeland Bay (1), Countess of Warwick Sound (3), settlement (1).

North region:
Barrow Strait–Resolute Bay (6); Jones Sound–Craig Harbour (5).
Specimens were collected alive at depths of from 6 to 10-30 m.

Canadian Arctic literature records

Exeter Sound, Baffin Island, and off Ellesmere Island (Thorson 1951: 40); Jones Sound (Grieg 1909: 31, as var. *sericatum* of *B. grönlandicum*); Dobbin Bay [Kane Basin] (Smith 1877: 134, and 1878: 225).

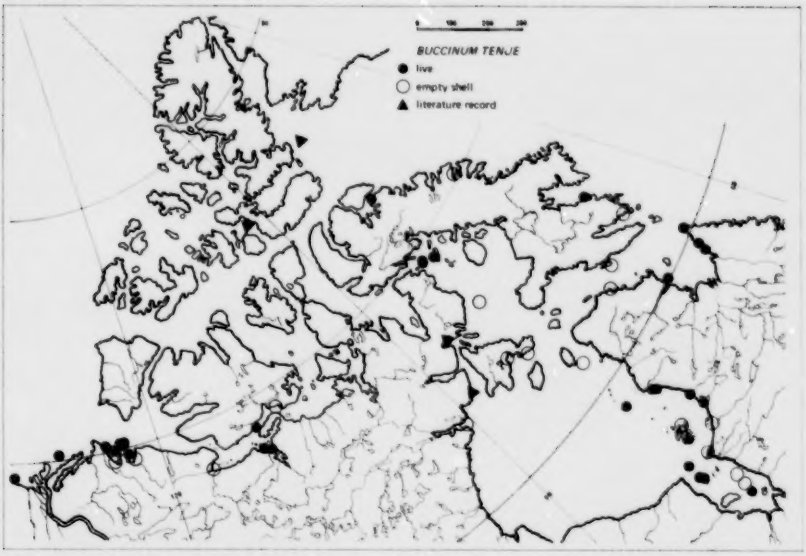
Also recorded from West Greenland, Svalbard, Finmark, Barents Sea, Kara Sea (Thorson 1951); Arctic Ocean, off New Siberian Islands (Gorbunov 1946). Depths from 6 m (Barrow Strait) (this study) to 59 m (off New Siberian Islands) (Gorbunov 1946).

BUCCINUM TENUE Gray

Plate VI, fig. 8. Map 46.

Buccinum tenue Gray, 1839: 128, pl. 36: 19.
Type locality: Ice Cape [Alaska].

Buccinum scalariforme "Beck" Möller, 1842: 11.



Map 46

Description of specimens

The shell is moderately thick, up to 62 mm long, and a dull pinkish, yellowish, purplish, or greyish brown. There are 7 to 9 convex whorls with deep sutures and a small, blunt apex. Numerous narrow and curved axial ribs vary greatly in height, width, and distance apart, and are reduced to fine raised lines in a few specimens. Some originate at the sutures, and extend varying distances down the whorl; others originate part way down and extend part or all the way to the base. The spiral sculpture consists of close, incised lines that cut into the longitudinal ribs. The small aperture is less than ½ the height of the shell. Two twists are usually visible on the straight columella. The callus has a thick, narrow, white inner part and a thinner, wider, darker layer outside it. At the base of the columella there is usually a prominent bump on the body whorl. The canal is short and narrow. The ovate operculum has a straight inner and a convex outer margin and has its nucleus near the outer edge. There is a thin brown periostracum on a few specimens.

The shell of this species is recognized by its numerous and intercalated axial ribs and close, deep, spiral lines.

Origin of specimens

Southeast region:

Hudson Strait—near Port Burwell (14), King George Sound (1); Ungava Bay—northeast (28), west (2); James Bay—east coast (4), Twin Islands (2), near mouth (6); Hudson Bay east—near Long Island (2), between Great Whale and Richmond Gulf (1), Belcher Islands (4), off Nastapoka River (3), Hopewell Sound (28), near Ottawa Islands (3), off Cape Smith (1); Evans Strait (7); Fisher Strait (1); Hudson Bay west—off Chesterfield Inlet (2); Repulse Bay (1).

Northeast region:

Hudson Strait—Big Island (1); Frobisher Bay—Countess of Warwick Sound (1); Cumberland Sound—Ptarmigan Fiord (1); Foxe Basin—north (32); Baffin Bay—Clyde (4); Eclipse Sound—Pond Inlet (1).

Northwest region:

Dease Strait (5); Bathurst Inlet—near settlement (1), near Baychimo Harbour (ca. 120); Coronation Gulf—Couper Islands (1); Dolphin and Union Strait (4); Darnley Bay (4); Amundsen Gulf—near Cape Parry (9); Franklin Bay (10); Beaufort Sea—off Warren Point (3); Mackenzie Bay—off Herschel Island (4). Specimens were collected alive on mud and rock at depths of from 4.5 to 100 m.

Canadian Arctic literature records

Port Burwell and "Upper Savage Island," Hudson Strait* (Whiteaves 1885: 59DD, 60DD); Port Burwell, Hudson Strait* and perhaps Southampton Island (Dall 1924*a*: 34A, 35A); Hudson Strait (Halkett 1898: 80); northeast, southeast, and southwest Hudson Bay (Pelletier *et al.* 1968: 574); Repulse Bay, Roes Welcome Sound (Laurson 1946: 55, 56); off Ellesmere Island (Thorson 1951: 45); Bernard Harbour, N.W.T. (MacGinitie 1959: 107). Reeve (1855: 394) gives no locality for his record of *Buccinum scalariforme*, but it might have been collected from west of Devon Island.

Also recorded from Gulf of Maine (LaRocque 1953); Newfoundland, Labrador, West Greenland, Iceland, Svalbard, Finmark, Franz Joseph Islands, Barents Sea, Kara Sea, Siberian Ice Sea, and Bering Sea (Thorson 1941); Point Barrow, Alaska to Aleutians and Puget Sound (MacGinitie 1959). Depths from 4 m (Novaya Zemlya) (Thorson 1941) to 540 m (Davis Strait) (Thorson 1951).

BUCCINUM TOTTENI Stimpson

Plate VI, fig. 12. Map 47.

Buccinum tottenii Stimpson, 1865: 385. Type locality: Newfoundland Banks.

Description of specimens

The shell is up to 60 mm long, and yellowish brown. Some specimens are rather reddish. There are 6 to 8 tumid whorls with deep sutures and a small blunt apex. Straight axial folds (17-21 on the body whorl) are parallel to raised growth lines. They are less distinct on the body whorl and extend only a little past the shoulder. The numerous crowded spiral ribs of different widths are incised by deep spiral lines. In most specimens, from 1 to 12 spiral ribs are more prominent than others. The columella is strong with one twist visible, and the callus is narrow. The aperture is more than ½ the height of the shell. The nucleus of the oval or oblong operculum is in the centre. There is a light yellowish brown periostracum with numerous short sturdy bristles.

The shell of this species is recognized mainly by the straight axial folds, uneven, crowded, spiral ribs, and operculum with a central nucleus. The wider, longer, axial folds, more rounded, heavier spiral ribs, and unshouldered whorls distinguish it from that of *B. polare*.

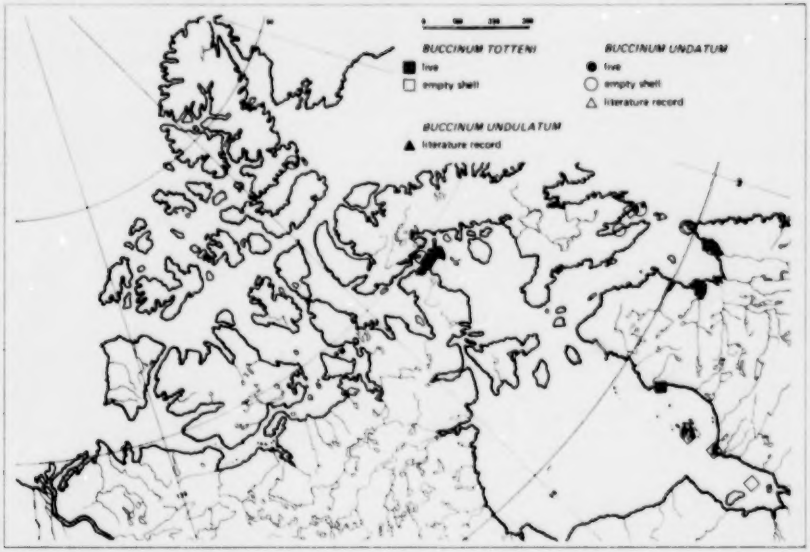
Origin of specimens

Southeast region:

Hudson Strait—Port Burwell (1); Ungava Bay—Adlorilik (1), south of Leaf Bay (1); James Bay—south Twin Island (1); Hudson Bay east—off Long Island (1), Belcher Islands (1), near Port Harrison (7).

Northeast region:

Frobisher Bay—Countess of Warwick Sound (1 may be of this species); Foxe Basin—north (7).



Map 47

Specimens were collected alive on mud, sand, and rock at depths between 9 and 80-100 m.

Recorded for the first time from arctic Canada.

Also recorded from Svalbard and north of Iceland (Thorson 1941); Labrador (Allen 1965); Franz Joseph Islands, Novaya Zemlya, and Bering Sea (Odhner 1915). Depths from about 9 m (Hopewell Sound) (this study) to 548 m (off Labrador) (Allen 1965).

BUCCINUM UNDATUM Linnaeus
Plate VI, fig. 13. Map 47.

Buccinum undatum Linnaeus, 1758: 740.
Type locality: "O. Europaeo".

Dautzenburg and Fischer (1912: 104) list some of the many possible synonyms of this name.

Description of specimens

The shell is moderately thick, up to about 66 mm long, and white or rosy brown. There are 6 to 7 gradually enlarging whorls with deep sutures. The first half whorl is flat, and the next is smooth, inflated, and in some specimens appears lopsided. Oblique axial folds are more prominent on the early whorls. In some specimens these are quite distinct and in others, barely visible, even at the sutures. Thick, rounded spiral ribs alternate with one or more narrow ones. Toward the base of the body whorl the spiral ribs become more or less equal in size and in distance apart. The columella is strong and has a narrow callus. The aperture is ½ the height of

the shell. The operculum is large; its oval shape is flattened on the inside, and its nucleus is between the centre and the outside edge. The periostracum is thin, smooth, and yellowish brown.

By the greater relative size, more oblique axial folds, and smooth periostracum one may best distinguish the shell of this species from that of *B. ciliatum*; by the axial folds and sharper spiral ribs of alternating sizes, from that of *B. belcheri*; by the larger apex and strong spiral sculpture, from that of *B. cyaneum*; by the curved axial folds and acentric nucleus of the operculum, from that of *B. totteni*; and by the coarser spiral sculpture and fewer whorls, from that of *B. undulatum*.

Origin of specimens

Southeast region:
Hudson Strait–Button Islands (2); Ungava Bay–east coast (3), off Leaf Bay (4).

Northeast region:
Frobisher Bay–Kneeland Bay (8); Foxe Basin–north (7); Fury and Hecla Strait (1).

North region:
Jones Sound–Craig Harbour (1 may be of this species).

Specimens were collected alive on mud and rock at depths of between 15-27 and 95 m.

Canadian Arctic literature records

Northeast Hudson Bay (Pelletier *et al.* 1968: 574); Southampton Island, Hudson Bay (Dall 1924*a*: 34A).

Also recorded from New Jersey to Labrador (Whiteaves 1901); West Greenland, Jan Mayen, Iceland, Faroe Islands, British Isles, Bay of Biscay, Svalbard, Norway, White Sea, Barents Sea, and possibly Siberian Ice Sea and Sea of Okhotsk (Thorson 1941); Point Barrow, Alaska (MacGinitie 1959). This species does not occur in the Pacific or off Alaska. Depths from 5 (Faroes) to 642 m (Norway) (Thorson 1941).

BUCCINUM UNDULATUM Möller
Map 47.

Buccinum undulatum Möller, 1842: 11.
Type locality: Greenland. See Posselt and Jensen (1898: pl. 1: 7) for figure.

Hancock (1846: 327) records this species from the "west coast of Davis Strait" [Cumberland Sound]. The type specimen has been examined, and its shell differs from that of *B. undatum* from North America and Europe mainly in its many whorls (9-10), higher spire, and much finer spiral ribs. The shell of this species can be distinguished from that of some large *B. finmarkianum* by the stronger oblique axial folds and coarser spiral ribs. The species is also recorded from the Gulf of St. Lawrence, off Newfoundland (National Museum of Canada collection); Labrador (Verkrüzen 1881); West Greenland (Posselt and Jensen 1898); Jan Mayen (Thorson 1944); off Norway (Friele 1882); and Kara Sea (Leche 1878). Depths from 6 m (West Greenland) (Grieg 1909) to 228 m (off Newfoundland) (National Museum of Canada collection).

Volutidae

VOLUTOMITRA H. & A. Adams, 1853
Type species (by monotypy):
Mitra groenlandica Möller

VOLUTOMITRA GROENLANDICA (Möller)
Map 48.

Mitra groenlandica Beck Möller, 1842: 15.
Type locality: Greenland.

This species was recorded by Reeve (1885: 395). His specimen perhaps came from west of Devon Island. The shell is recognized by its white colour and corneous periostracum (Tryon 1882). It is figured by Sars (1878: pl. 23: 12). Thorson (1944) records it from Cape Cod to West Greenland, East Greenland, Iceland, Faroe Islands, and Norway from 40 (West Greenland) to 549 m (Norway).

Cancellariidae

ADMETE Möller, 1842
Type species (by monotypy):
Admete crispa Möller [=*Cancellaria couthouyi* Jay]

ADMETE COUTHOUYI (Jay)
Plate III, fig. 14. Map 48.

Not *Tritonium viridulum* Fabricius (1780: 402) (Turridae)

Murex costellifera Sowerby, 1818: 225, pl. 199: 3 (not seen) *nomen oblitum.*

Cancellaria buccinoides Couthouy, 1838: 105, pl. 3: 3; *non* Sowerby, 1832.

Cancellaria couthouyi Jay, 1839: 77.
Type locality: Massachusetts Bay.

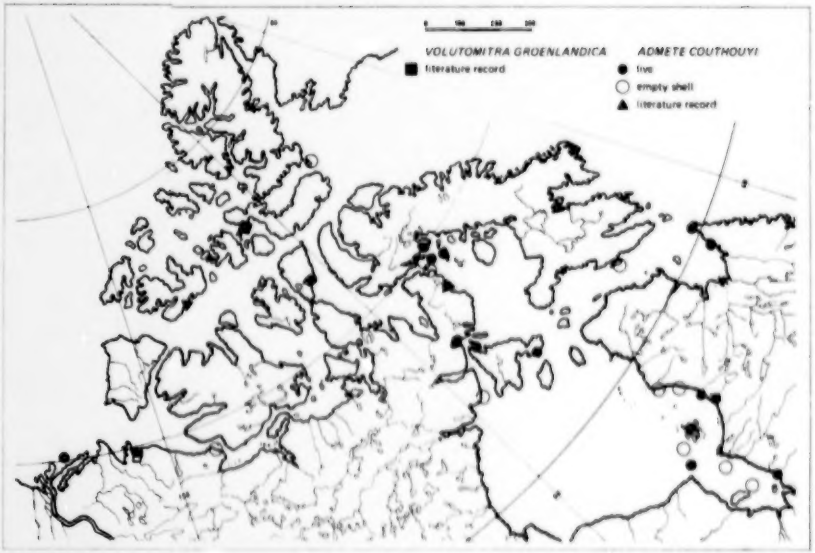
Admete borealis A. Adams, 1855: 122.

Admete viridula var. *laevior* Leche, 1898: 48.

This species is the *"Admete viridula* (Fabricius)" of many authors. Dall (1887: 298), however, having examined the type of Fabricius' species, states that it was "a *Bela*, like *B. exarata* and not an *Admete* at all."

Description of specimens

The shell is variable in thickness, up to 23 mm long, and dingy white. There are 5 to 7 whorls with distinct sutures and an acute apex. In about $^2/_3$ of the specimens (especially those from Ungava Bay and Hudson Bay), distinct, rather oblique axial folds are present, at least on the earlier whorls. These folds are very variable and may be numerous or few, distant or close, narrow or wide, low or high; however, they always disappear shortly after rounding the shoulder of the body whorl. There are distinct rounded spiral ribs, variable in strength and number. There may be nodes on the ribs where they are intersected by the longitudinal sculpture. The columella is slightly curved; in some specimens 2 or 3 twists are visible, whereas in others it appears smooth. The callus is large, smoothly rounded, and in many



Map 48

specimens is invaded by the outer layer of the shell and the ribs. The aperture is about ½ the height of the shell. The outer lip is crenulated in a few specimens and curves evenly to a barely perceptible canal. There is no operculum. In most specimens, the periostracum is chestnut coloured and adherent, but there are some in which it is flaky and yellow.

The short, narrow canal and straight oblique ribs, parallel to the lines of growth, best distinguish the shell of this species from that of small *Buccinum undatum*.

Origin of specimens

Southeast region:
Hudson Strait–Port Burwell (2); Ungava Bay east (6); James Bay–off Eastmain River (1), north of Twin Islands (4), off Cape Jones (1); Hudson Bay east–Belcher Islands (2), Richmond Gulf (3), off Nastapoka River mouth (1), between Nastapoka River and Port Harrison (4), near Port Harrison (17); Hudson Bay west–off Cape Henrietta Maria (1); Roes Welcome Sound (1); Frozen Strait (2); Repulse Bay (1).

Northeast region:
Hudson Strait–Big Island (2); Foxe Basin–north (14); Prince Regent Inlet–Creswell Bay (13).

North region:
Jones Sound–Coburg Island (1).

Northwest region:
Dolphin and Union Strait (1); Darnley Bay (1); Mackenzie Bay (3).

Specimens were collected alive on mud, sand, and rock at depths of from 10 to 130 m.

Canadian Arctic literature records

South side of Hudson Strait (Dall 1924*a*: 34A); "Upper Savage Island," Hudson Strait (Whiteaves 1855: 59DD, as *Admete viridula*); southwest Hudson Bay (Pelletier *et al.* 1968: 574, fig. 12: 4, as *Buccinum ciliatum*; and 575, as *Admete laevior*); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 330, as *Cancellaria costellifera*); west coast of Foxe Basin (Laurson 1946: 54, as *Admete viridula*); Exeter Sound, Baffin Island (Thorson 1951: 58, as *Admete viridula*).

Also recorded from New England to West Greenland, the Hebrides to Svalbard, Norway, and Soviet Arctic to Bering Sea (Thorson 1944); Point Barrow, Alaska to California and Japan (MacGinitie 1959). Depths from 3 (Novaya Zemlya) to 1010 m (English Channel) (Thorson 1944).

Turridae

THESBIA Jeffreys, 1867
Type species (by monotypy):
Tritonium ? nanum Lovén

THESBIA NANA (Lovén)
Plate VII, fig. 1. Map 49.

Tritonium ? nanum Lovén, 1846: 12. Type locality: Finmark.

Description of specimen

The shell is thin, about 12 mm long, and white. Six to 7 whorls enlarge gradually from a pointed apex. Growth lines cross low, close spiral ribs. The columella is slightly curved, and the callus is wider at the base. The aperture is a little more than $^1/_3$ the height of the shell. There is a very shallow anal notch and a wide canal. The operculum is thin, wide at the top, and pointed at the base.

The shell of this species is best distinguished from other arctic turrids by the lack of axial sculpture and higher spire.

Origin of specimen

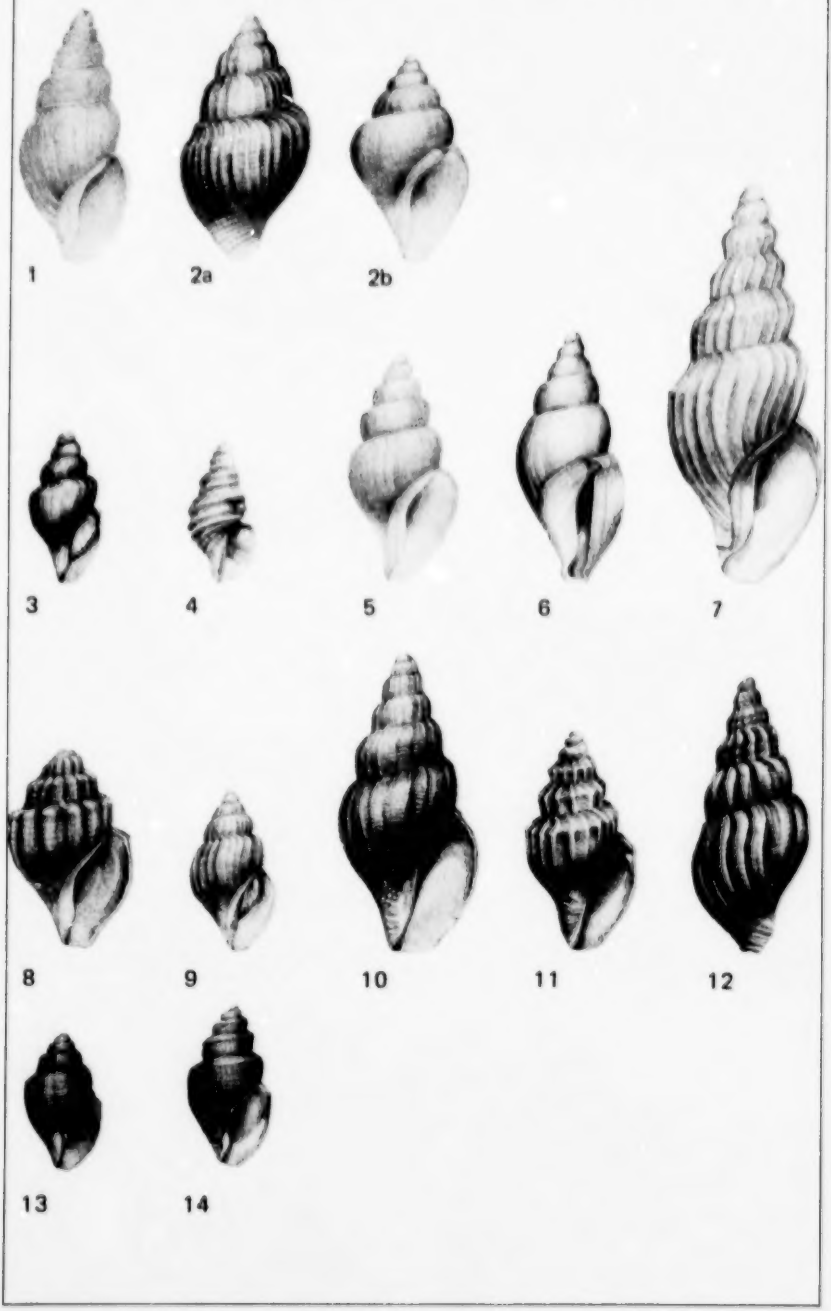
Southeast region:
Hudson Bay–Richmond Gulf (1).

The specimen was collected alive on mud at a depth of between 95 and 130 m.

Recorded for the first time from arctic Canada.

Also recorded from Shetland Islands, Orkney Islands, and Iceland from 75 (Norway) to 188 m (Norway) (Thorson 1941).

Plate VII



OENOPOTA Mörch, 1852
Type species (by subsequent designation, Dall, 1919):
Fusus pleurotomarius Couthouy [=*Buccinum pyramidale* Strøm]

Species in this group have been variously referred to the genera *Defrancia, Pleurotoma, Bela,* and *Lora* by many authors. I follow Powell (1942: 18) in using the name *Oenopota*, and Grant and Gale (1931) in assigning the following species to a single genus.

OENOPOTA ARCTICA (A. Adams)
Plate VII, figs. 2a, b. Map 49.

Bela arctica A. Adams, 1855: 121.
Type locality: "Arctic Seas."

This is the "*Bela viridula* Fabricius" of many authors and the "*Bela viridula* (Möller)" of Sars (1878, pl. 16: 7, 8).

Description of specimens

The shell is moderately thick, up to about 10 mm long, and white. There are 6 rapidly enlarging whorls. The early whorls (except for the first) have a rather elongated appearance in many specimens. Numerous thin axial ribs appear straight below the slight spiral ridge below the shoulder. They are crossed by wide and high spiral ribs alternating with lower, narrower ones. There are a few specimens (see Pl. VII, fig. 2b) from the most northerly stations, with thinner shells, more inflated whorls, and much finer sculpture; the straight axial ribs are so low as to be barely visible, especially on the body whorl. These shells resemble the variety *'inflata'* of

Plate VII (all X 3)

Figure

1
THESBIA NANA
(Lovén). NMC 35493, Richmond Gulf, Que., 109

2a
OENOPOTA ARCTICA
(A. Adams). NMC 36450, Foxe Basin, N.W.T., 111

2b
OENOPOTA ARCTICA
(A. Adams). NMC 36064, near Pond Inlet, N.W.T., 111

3
OENOPOTA OBLIQUA
(G.O. Sars). NMC 36686, Creswell Bay, N.W.T., 119

4
TARANIS AMOENA
(G.O. Sars). NMC 36698, Creswell Bay, N.W.T., 124

5
OENOPOTA cf. *CINEREA*
(Möller). NMC 36020, Mould Bay, N.W.T., 114

6
OENOPOTA BICARINATA
(Couthouy). NMC 35866, Cape Pembroke, Hudson Bay, 113

7
OENOPOTA ELEGANS
(Möller). NMC 24040, Ungava Bay, Que., 117

8
OENOPOTA INCISULA
(Verrill). NMC 38379, Port Harrison, Que., 118

9
OENOPOTA DECUSSATA
(Couthouy). NMC 38416, Nastapoka River mouth, Que., 115

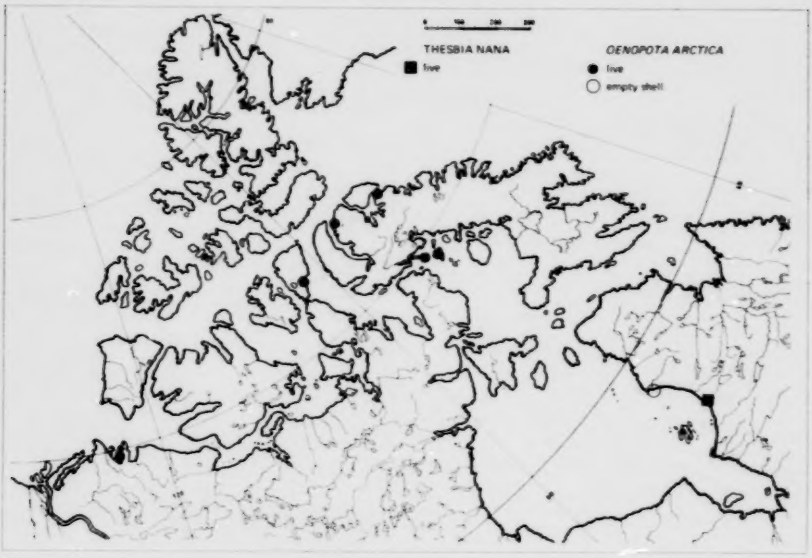
10
OENOPOTA DECLIVIS
(Lovén). NMC 36014, Hudson Bay, N.W.T., 115

11
OENOPOTA TURRICULA
(Montagu). NMC 36402, Foxe Basin, N.W.T., 123

12
OENOPOTA PYRAMIDALIS
(Strém). NMC 36577, Roes Welcome Sound, N.W.T., 121

13
OENOPOTA RETICULATA
(Brown). NMC 35704, Mould Bay, N.W.T., 121

14
OENOPOTA NOVAJASEMLIENSIS
(Leche). NMC 4486, Mould Bay, N.W.T., 119



Map 49

"Bela decussata" of Posselt and Jensen (1898: 154, pl. 1: 4). The columella is curved, and the callus is quite wide. The aperture is ½ the height of the shell. A crenulated outer lip is slightly recurved at the base where there is a short canal. The operculum is very small and narrow. The light chestnut-coloured periostracum adheres here and there on the shell.

The shell of this species is recognized by the produced apex, the decussated appearance of the sculpture, and the colour of the periostracum.

Origin of specimens

Southeast region:
Hudson Bay east–off Port Harrison (1).

Northwest region:
Franklin Bay (2 worn shells may be of this species).

Northeast region:
Frobisher Bay–near settlement (1); Foxe Basin–north (14); Prince Regent Inlet–near Creswell Bay (2); Admiralty Inlet–Arctic Bay (1); Eclipse Sound (4). Specimens were collected alive on clay, mud, sand, and rock at depths of between 3 and 15-40 m.

Recorded for the first time from arctic Canada.

Also recorded from Newfoundland (?) Norway and Alaska (Grant and Gale 1931); West Greenland (Posselt and Jensen 1898); between Norway and Svalbard (Friele 1886). Depths from 3 (Foxe Basin) to 15-40 m (Prince Regent Inlet) (this study).

OENOPOTA BICARINATA (Couthouy)

Plate VII, fig. 6. Map 50.

Pleurotoma bicarinata Couthouy, 1838: 104, pl. 1: 11.
Type locality: Massachusetts Bay.

Pleurotoma violacea Mighels and Adams, 1842: 51, pl. 4: 21.

Description of specimens

The shell is thin, up to 15 mm long, and light brown or purplish. There are 6 to 7 smoothly rounded, regularly enlarging whorls. The axial sculpture is confined to growth lines except for fine riblets on the early whorls of a few young specimens. Spiral ribs are low but rounded, and alternately wide and narrow in most cases. Two or more of these ribs are most prominent and form 'carinae', at least on the early whorls. In some specimens these 'carinae' are worn or not developed. The columella is slightly curved, and its callus is wide and shiny. The aperture is barely less than ½ the height of the shell. The outer lip is slightly flared with a clear anal notch. The canal is short. The operculum has a pointed and recurved base. A few specimens bear traces of a yellow periostracum.

The shell of this species is best recognized by the regular taper, the wide columellar callus, and the close, rounded spiral ribs.

Origin of specimens

Southeast region:
Hudson Strait—Port Burwell (2), Diana Bay (3); Hudson Bay east—off Port Harrison (5), off Cape Smith (5); Evans Strait (7); Roes Welcome Sound (2).

Northeast region:
Hudson Strait—Lake Harbour (1); Frobisher Bay (2); Davis Strait—between Frobisher Bay and Cumberland Sound (4); Cumberland Sound (6); Foxe Basin—north (18); Prince Regent Inlet—Creswell Bay (6); Admiralty Inlet—Arctic Bay (1), Moffet Inlet (1); Eclipse Sound (7).

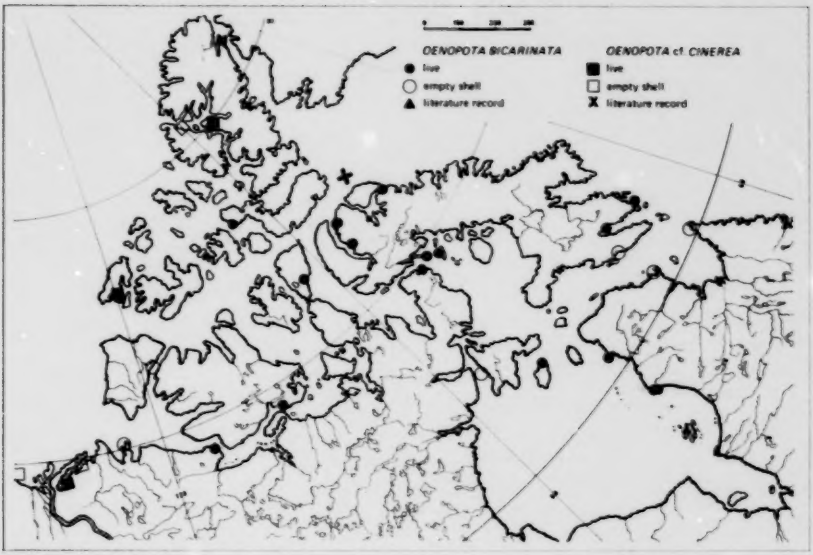
North region:
Barrow Strait (1); Penny Strait (2); Crozier Channel (1 may be of this species); Eureka Sound—Slidre Fiord (2).

Northwest region:
Dease Strait (1); Dolphin and Union Strait (3); Amundsen Gulf—near Cape Parry (1); Prince of Wales Strait (1).

Specimens were collected alive on clay, mud, sand, gravel, and rock from the intertidal zone to a depth of 70 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait* (Whiteaves 1885: 60DD); Arctic Bay* and Eclipse Sound*, Baffin Island (Ellis 1960: 40, as *Bela violacea*); "Discovery Bay, 81°41'N. lat." [Discovery Harbour] (Smith 1877: 132 and 1878: 224, as *Pleurotoma (Bela) violacea*); Bernard Harbour, Dolphin and Union Strait* (Dall 1919*a*: 15A, as *Lora becki*).
Also recorded from New England to Labrador (Whiteaves 1901); West Greenland, North Atlantic to Svalbard, Soviet Arctic, Bering Strait, and British Columbia (Thorson 1944). Depths from 0 (Frobisher Bay) (this study) to 1447 m (north Greenland Sea) (Golikov 1964).



Map 50

OENOPOTA cf. *CINEREA* (Möller)
Plate VII, fig. 5. Map 50.

Defrancia cinerea Möller, 1842: 13. Type locality: Greenland.

Description of specimens

The shell is moderately thin, up to about 12 mm long, and greyish white. There are about 7 slightly shouldered whorls. Irregular, narrow, straight axial folds are more distinct on the early whorls and barely visible on the body whorl of some specimens. There are very narrow, widely separated spiral ribs. The columella is nearly straight, and the callus is moderately wide. The narrow aperture is less than ½ the height of the shell. The canal is short and rather wide. The ovate operculum is narrow. There is a light yellowish brown periostracum.

The shell of this species is recognized by its shouldered body whorls, fine sculpture, and high spire. Its whorls are rounded and its shoulders more sloping than those of *O. novajasemliensis* and *O. turricula*.

Origin of specimens

North region:
Eureka Sound–Slidre Fiord (10); Nansen Sound (1); Crozier Channel–Mould Bay (2).

Northwest region:
Coronation Gulf–mouth of Coppermine River (8); Liverpool Bay (ca. 50); Mackenzie Bay–near Herschel Island (1).

Specimens were collected alive on mud at depths of from 4.5 to 52 m.

Canadian Arctic literature records

Off Lancaster Sound (Thorson 1951: 60).

Also recorded from West Greenland, Iceland, between Faroe Islands and Scotland, Finmark, and Svalbard (Thorson 1951); off Norway (Friele 1886). Depths from 4.5 m (Mould Bay) (this study) to 761 m (Svalbard) (Thorson 1941).

OENOPOTA DECLIVIS (Lovén)
Plate VII, fig. 10. Map 51.

Tritonium declive Lovén, 1846: 13.
Type locality: Finmark.

Description of specimens

The shell is thin, up to 15 mm long, and white. Six to 7 rounded whorls enlarge slowly from a produced apex. Axial ribs (up to 24 on the body whorl) are high, sharp, only slightly curved, and extend in most cases to the base of the body whorl. They are crossed by well spaced and very sharply defined revolving ribs, so that the edges of the longitudinal ridges have a serrated appearance. Some of the spirals are stronger than others and, in a few specimens, appear as carinae on the early whorls. The columella is barely curved, and the callus is rather narrow. The aperture is less than ½ the height of the shell. The outer lip has a crenulated edge. The canal is short but wide. The operculum is ovate. In the sutures are traces of the yellowish periostracum.

The shell of this species is recognized by its high, sharp sculpture, turnid whorls, and round shoulders.

Origin of specimens

Southeast region:
Hudson Bay east–off Belcher Islands (1), Port Harrison (2).

Northeast region:
Frobisher Bay (2); Foxe Basin–north (1); Fury and Hecla Strait (1); Prince Regent Inlet–Creswell Bay (1).

Specimens were collected alive on clay, mud, and sand at depths of from 18 to 15-40 m.

Recorded for the first time from arctic Canada.

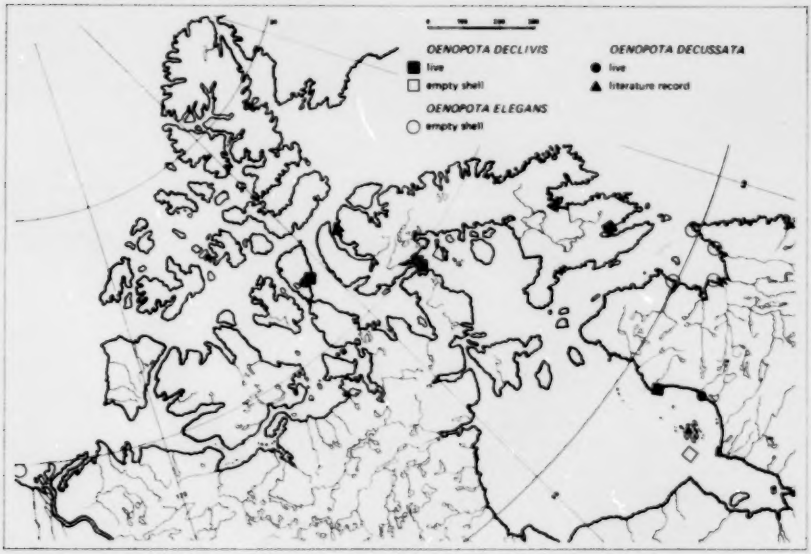
Also recorded from West Greenland and Finmark (Thorson 1944). Depths from 18 (Hudson Bay) (this study) to 107 m (West Greenland).

OENOPOTA DECUSSATA (Couthouy)
Plate VII, fig. 9. Map 51.

Pleurotoma decussata Couthouy, 1838: 183, pl. 4: 8 (figure is very poor).
Type locality: Massachusetts Bay.

Bela tenuicostata M. Sars, 1868: 259.

Friele (1886) and Thorson (1951) synonomize *Bela conoidea* G.O. Sars with this species.



Map 51

Description of specimens

The shell is very thin, up to 8 mm long, and white. Five to 6 smoothly rounded whorls enlarge regularly from a rounded apex. Low, sigmoid ribs fade out just below the shoulder and are crossed by fine, sharp, nearly equidistant spiral ribs. The columella is straight, and the callus is fairly wide (mainly at the base). The aperture is ½ the height of the shell. The outer lip is crenulated, and the anal sinus is round and moderately deep. The canal is short. The operculum is ovate. A light olive-coloured periostracum clings at the sutures.

The shell of this species is recognized by its small size, its thinness, and the appearance of the sculpture.

Origin of specimens

Southeast region:
Hudson Bay--near mouth of Nastapoka River (1).

Specimens were collected alive on mud at depths of between 19-40 and 34-53 m.

Northeast region:
Foxe Basin–north (1); Prince Regent Inlet–Creswell Bay (1).

Canadian Arctic literature records

"west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 331); Arctic Bay, Baffin Island (Ellis 1960: 40).

Also recorded from New England to Labrador, West Greenland, East Greenland, North Atlantic to Svalbard, and Barents Sea to Bering Sea (Thorson 1944); Point Barrow, Alaska (MacGinitie 1959). Depths from 3 (Novaya Zemlya) to 2582 m (North Atlantic) (Thorson 1944).

OENOPOTA ELEGANS (Möller)
Plate VII, fig. 7. Map 51.

Defrancia elegans Möller, 1842: 13.
Type locality: Greenland.

Not *Pleurotoma cancellata* Mighels and Adams, 1842 (preoccupied).

"Bela cancellata (Mighels)" Verrill, 1882: pl. 43: 10, 11.

Description of specimens

The shell is thin, up to 18 mm long, and white. Six to 8 sharp-shouldered whorls form an acute spire. Axial ribs (up to 20 on the body whorl) are high, quite thick, well spaced, and strongly oblique with a shallow, angular sinus at the shoulder. There are low and narrow spiral ribs. One specimen is also carinate at the shoulder. The columella is slightly curved, and the callus is narrow at the top. The narrow aperture is barely less than ½ the height of the shell. The outer lip is smooth with a shallow anal notch. The canal is broad in the adult. The operculum is oval.

The shell of this species is recognized by its shouldered whorls and the angled appearance of its axial ribs.

Origin of specimens

Southeast region:
Hudson Strait—Port Burwell (1); Ungava Bay—near Payne Bay and Leaf Bay (3).

Northwest region:
Mackenzie Bay—Herschel Island (1).

The specimens were all collected empty, but appear fresh.

Recorded for the first time from arctic Canada.

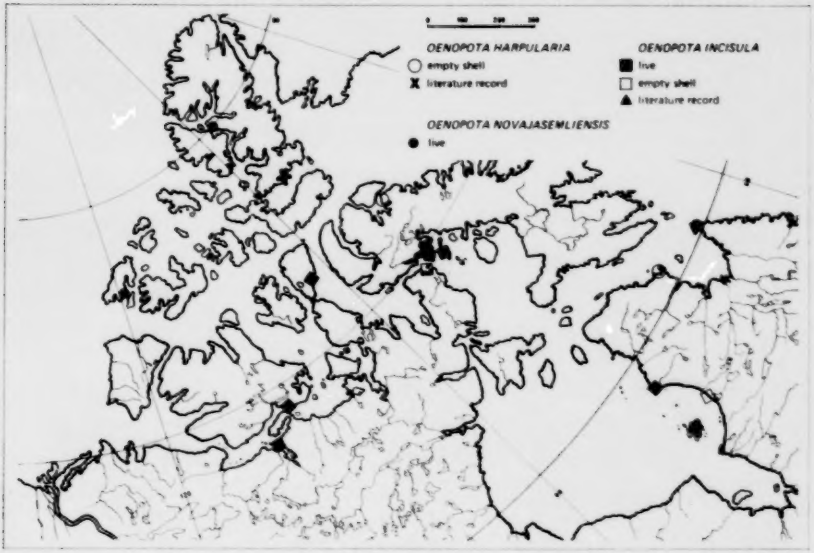
Also recorded from New England (Mighels and Adams 1842); West Greenland and Iceland (Posselt and Jensen 1898); North Greenland Sea, Arctic Basin, Norway, Barents Sea to Bering Sea (Golikov 1964); Bering Sea to Point Barrow, Alaska (MacGinitie 1959). Depths from 45 to 1203 m (Golikov 1964).

OENOPOTA HARPULARIA (Couthouy)
Map 52.

Fusus harpularius Couthouy, 1831: 106, pl. 1: 10.
Type locality: Massachusetts Bay.

This species is figured in Verrill 1882: pl. 43: 14.

An empty and worn shell collected at Diana Bay, Hudson Strait, may be of this species. Another shell in poor condition from Pond Inlet, Eclipse Sound, Baffin Island, referred to by Ellis (1960: 40) as *Bela exarata*, may also be of this species. The shell is recognized by its strong but rounded shoulders, heavy axial sculpture, and brownish colour. Grieg (1909: 26) said he had a worn and empty shell of this species from Jones Sound. It is also recorded from Long Island Sound to Nova Scotia (Verrill 1882); West Greenland (Posselt and Jensen 1898); Norway, and Soviet Arctic to Bering Sea from 38 (Norway) to 693 m (North America) (Golikov 1964).



Map 52

OENOPOTA INCISULA (Verrill)
Plate VII, fig. 8. Map 52.

Bela incisula Verrill, 1882: 461, pl. 43: 12. Type locality: Labrador.

Description of specimens

The shell is thick, up to 10.5 mm long, yellowish white, and very shiny when fresh. It has a blunt appearance with 5 to 6 shouldered whorls. The axial ribs (about 20 on the body whorl), which are smooth, oblique, but not curved, are quite high in some specimens. They start at the subsutural band of each whorl and fade out toward the base of the body whorl. On some specimens the axial ribs fade out even on the early whorls, and the body whorl of one specimen lacks axial ribs entirely. Some specimens have nodes at the shoulder and strongly curved growth lines. Sharply incised revolving grooves make broad flat spiral bands. The columella is curved and the callus is moderately wide. The aperture is about ½ the height of the shell. The outer lip flares out in an angle at the shoulder and is then incurved. The anal notch is shallow, and there is a relatively wide and short canal. The operculum is oval. A pale greenish periostracum adheres mainly at the sutures.

The shell of this species is recognized by its thick longitudinal ribs and the flat spiral bands.

Origin of specimens

Southeast region:
Hudson Bay east–Belcher Islands (4), off Nastapoka River (1), Port Harrison (5).

Northwest region:
Dease Strait–Starvation Cove (2); Bathurst Inlet–mouth (1).

Northeast region:
Foxe Basin—north (5); Prince Regent Inlet—Creswell Bay (3).

Specimens were collected alive on clay, mud, sand, and rock at depths of from 6-7 to 140 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Whiteaves 1885: 60DD).

Also recorded from Martha's Vineyard to Newfoundland (Verrill 1882); West Greenland (Posselt and Jensen 1898); Bering Strait (Krause 1885). Depths from 6-7 m (Belcher Islands) (this study) to 914 m (off Martha's Vineyard) (Verrill 1882).

OENOPOTA NOVAJASEMLIENSIS (Leche)
Plate VII, fig. 14. Map 52.

Pleurotoma novaja-semliensis Leche, 1878: 53, pl. 1: 15. Type locality: Novaya Zemlya.

Description of specimens

The shell is thin and up to 11 mm long. The 6 whorls enlarge slowly from a mammilate apex and have such strong shoulders that the surface from shoulder to suture appears to be horizontal. Numerous growth lines cross fine, well defined spiral ribs (strongest on the body whorl), giving a reticulated appearance to the surface of the shell. The columella is barely curved and appears thickened near the base. The callus is very narrow. The wide aperture is ½ the height of the shell. The outer lip is flared at the shoulder and strongly recurved at the base, where the canal is short and moderately wide. The comparatively large operculum is wide throughout its length and has a curved base. A pale olive periostracum covers these specimens entirely.

The shell of this species is recognized by the tabulate whorls, the adherent periostracum, and the shape of the operculum. It is best distinguished from that of *O. reticulata* by the small ratio of body height to height of spire.

Origin of specimens

North region:
Crozier Channel—near Mould Bay (17); Eureka Sound—Slidre Fiord (5).

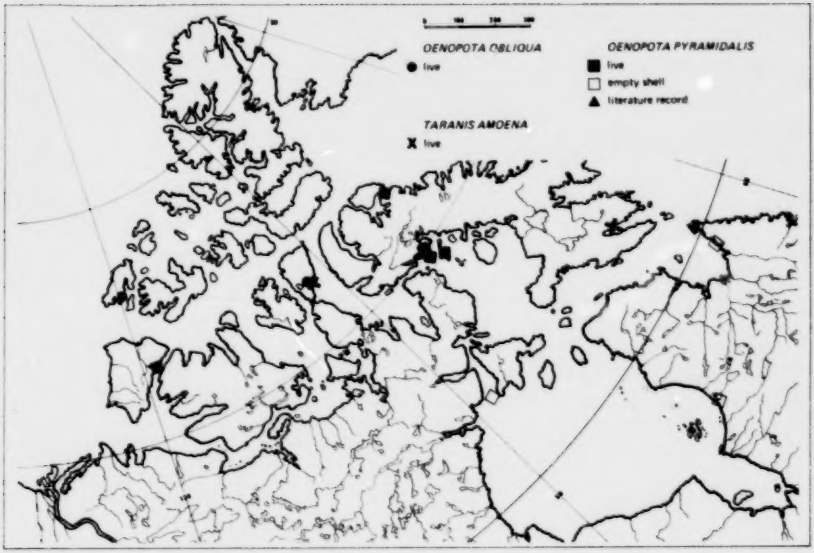
Specimens were collected alive on mud at depths of from about 6 to about 60 m.

Recorded for the first time from arctic Canada.

Also recorded from east Laptev Sea (Aurivillius 1887); Siberian Arctic Ocean (Løyning 1932); Arctic Ocean north of Bering Strait (Oldroyd 1927). Depths from about 6 m (Mould Bay) (this study) to about 164 m (Kara Sea) (Leche 1878).

OENOPOTA OBLIQUA (G.O. Sars)
Plate VII, fig. 3. Map 53.

Bela obliqua G.O. Sars, 1878: 226, pl. 6: 6.
Type locality: "Finmarksreise ved Hammerfaest."



Map 53

Description of specimens

The shell is thin, up to 9 mm long, and white. Six slightly shouldered whorls enlarge slowly from a rounded apex. The protoconch is variable – the second whorl is in some cases no larger than the first. The axial ribs (up to about 20 on the body whorl) are sharp and oblique, changing direction sharply at the shoulder, and the interspaces are three times the width of the rib. The spiral ribs are narrow and close. The columella is nearly straight, and the callus is narrow. The narrow aperture is less than ½ the height of the shell. The outer lip is flared at the shoulder and has a deep round anal notch. The canal is short and wide. The operculum is oval. There is a yellowish periostracum.

The deep anal notch best distinguishes the shell of this species from that of *O. elegans*, and the angle of the ribs differentiates it from that of *O. turricula*.

Origin of specimens

Northeast region:
Prince Regent Inlet–Creswell Bay (9).

North region:
Crozier Channel–near Mould Bay (3).

Specimens were collected alive on mud at depths of between 15-40 and 38-52 m.

Recorded for the first time from arctic Canada.

Also recorded from West Greenland, Iceland, Norway, Murman Coast, and Svalbard (Odhner 1915). Depths from 15-40 m (Creswell Bay) (this study) to 395-406 m (Odhner 1915).

OENOPOTA PYRAMIDALIS (Strøm)

Plate VII, fig. 12. Map 53.

Buccinum pyramidale Strøm, 1788: 297, pl. 1: 22 (not seen).
Type locality: not specified.

Fusus pleurotomarius Couthouy, 1838: 107, pl. 1: 9.

Defrancia vahlii "Beck" Möller, 1842: 13.

Description of specimens

The shell is moderately thick, up to 20 mm long, and pale chestnut. There are 7 to 8 rather slowly enlarging whorls. The thick and rounded axial ribs (about 17 on the body whorl) are sigmoid in shape and separated by spaces of about the same width. The ribs either extend to the base of the shell or fade out near the middle of the body whorl. Rounded spiral ribs are most evident on the early whorls. The columella is slightly curved, and the callus is moderately wide. The wide aperture, less than ½ the height of the shell, has a smoothly curved outer lip, and the canal is narrow. The operculum is ovate, and there is a yellowish periostracum.

The shell of this species is recognized by the sigmoid ribs, the rosy tan colour, and the even curve of the outer lip.

Origin of specimens

Southeast region:
Ungava Bay—Keglo Bay (2); Hudson Bay east—Richmond Gulf (1); Roes Welcome Sound (1).

Northwest region:
Prince of Wales Strait (1).

Northeast region:
Foxe Basin—north (4); Eclipse Sound (1).

Specimens were collected alive on mud, sand, and rock at depths of from 3 to 13-30 m.

Canadian Arctic literature records

Port Burwell, Hudson Strait (Whiteaves 1885: 60DD, as *Bela pleurotomaria*).

Also recorded from Martha's Vineyard to Labrador (Verrill 1882); Gulf of St. Lawrence and Bay of Fundy, West Greenland, North Atlantic to Svalbard, Soviet Arctic to Bering Strait (Thorson 1944); Point Barrow, Alaska to Friday Harbour, Washington (MacGinitie 1959); north Canadian Basin, 800 miles north of Bering Strait (Clarke 1963). Depths from 0 (Svalbard) (Thorson 1944) to 2010 m (Clarke 1963).

OENOPOTA RETICULATA (Brown)

Plate VII, fig. 13. Map 54.

Pleorotoma reticulata Brown, 1827: pl. 48: 29, 30 (not seen).

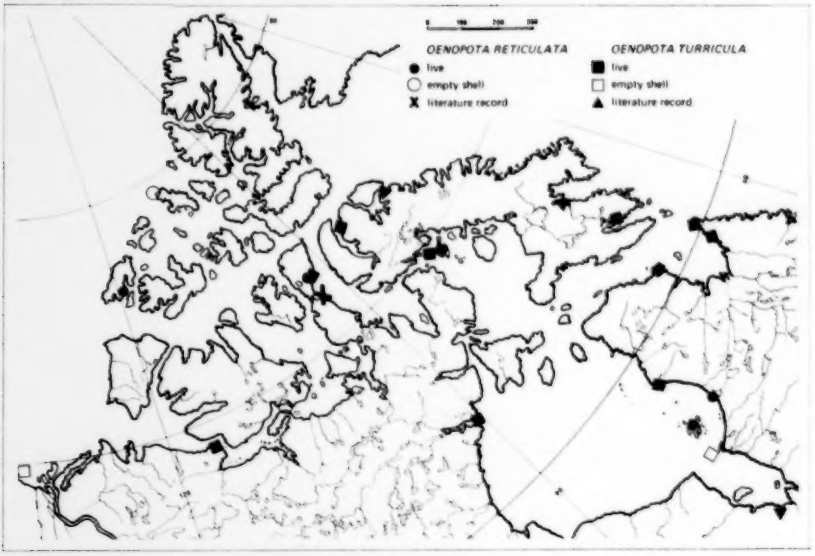
Type locality: Greenock [Scotland]. (*see* Brown 1844).

Pleurotoma trevellianum Turton, 1834: 351.

Bela metschigamensis Krause, 1885: 276, pl. 18: 2.

Description of specimens

The shell is thin, small (up to 9 mm long) and dingy white. There are 5 to 6 rapidly enlarging whorls that are flat above an indistinct subsutural carina. Straight, sharp



Map 54

longitudinal ridges are distinct on the early whorls but, in most specimens, do not extend below the carina on the body whorl. The spiral ribs are thin and only slightly rounded but are numerous and distinct, so that the shell has a reticulated appearance as these ribs cross the many close growth lines. The columella is barely curved, the callus moderately wide. The aperture is nearly $^2/_3$ the height of the shell. The outer lip is a little flared below the shoulder and the short canal is recurved at the base. The operculum is narrow. There is a thin yellowish periostracum.

Sharp ribs, shouldered whorls, longer canal, and thinner, less shiny shell, best distinguish the shell of this species from that of *O. incisula*.

Origin of specimens

Southeast region:
Hudson Bay east—near Richmond Gulf (4); Belcher Islands (1).

Northeast region:
Frobisher Bay—near settlement (1 may be of this species); Prince Regent Inlet—Creswell Bay (5).

North region:
Crozier Channel—near Mould Bay (1); Prince Gustav Adolf Sea—off Isachsen (1).

Northwest region:
Dease Strait (1).

Specimens were collected alive on clay and mud at depths between 11-27 and 38-48 m.

Canadian Arctic literature records

Port Kennedy [Gulf of Boothia] (Walker 1862: 71, as *Mangelia trevelliana*); near Isachsen, Ellef Ringnes Island* (Dall 1924: 31A, as *Lora scalaroides*).

Also recorded from New England to West Greenland, north Atlantic to Svalbard, Murman Coast, Barents Sea, and British Columbia (Thorson 1944); Bering Sea (Krause 1885); Arctic Ocean and North Greenland Sea (Golikov 1964). Depths from 9 (Svalbard) to 1447 m (North Greenland Sea) (Golikov 1964).

OENOPOTA TURRICULA (Montagu)
Plate VII, fig. 11. Map 54.

Murex turricula Montagu, 1803: pl. 9: 1.
Type locality: Sandwich, Kent [England].

Bela americana Packard, 1867: 285, pl. 7: 11.

Bela gouldii Verrill, 1882: 465, pl. 7: 6.

Some of the specimens examined compare well with the following representations of species that may be synonyms of *O. turricula: Bela nobilis* Möller (Sars 1878: pl. 16: 19, 20), *Bela rugulata* Möller (Sars 1878: pl. 23: 6), *Bela rugulata* Troschel (Friele 1886: pl. 7: 1), and *Bela scalaris* Möller (Sars 1878: pl. 23: 5).

Description of specimens

Members of this species vary considerably in the thickness and size of the shell (up to 18 mm long) and in the extent of coarseness of the sculpture. They have in common a white shell of 6 to 7 tabulate whorls with well impressed sutures and a pointed spire. The axial ribs, which are sharp, high, and straight, continue in most cases to the base of the body whorl. The shoulder may be nodulated at the site of a strong spiral cord. Revolving ribs are clearly marked and in many cases are alternately strong and weak. The columella is slightly curved, and its callus is narrow. The aperture is less than ½ the height of the shell. The outer lip, considerably flared at the shoulder, has a very shallow anal notch. The canal is short and narrow, and the operculum small and ovate. There is a light chestnut periostracum.

The shell of this species is recognized by its strong and sharp sculpture and sharply angled outer lip.

Origin of specimens

Southeast region:
Hudson Strait—Port Burwell (2), Diana Bay (1); Ungava Bay—near Adlorilik (1); Hudson Bay east—off Cape Jones (2), Hopewell Sound (8); Hudson Bay west—Chesterfield Inlet (2).

Northwest region:
Dease Strait (1); Dolphin and Union Strait (1); Mackenzie Bay—off Herschel Island (1).

Northeast region:
Frobisher Bay (2); Foxe Basin—north (15); Prince Regent Inlet—Creswell Bay (3); Admiralty Inlet—near Arctic Bay (1).

Specimens were collected alive on clay, mud, sand, and rock at depths of from 6-7 to 91 m.

Canadian Arctic literature records

Moosonee, James Bay (Richards 1936: 540, as *Bela americana*); "west coast of Davis Strait" [Cumberland Sound] (Hancock 1846: 331); Arctic Bay* and Eclipse Sound, Baffin Island (Ellis 1960: 40, as *Bela nobilis*); Bernard Harbour, (Dall 1919*a*: 15A, as *Lora exarata*).

Also recorded from Nova Scotia, Labrador, West Greenland, East Greenland, Faroe Islands, Svalbard, Norway, and Soviet Arctic to Bering Sea (Thorson 1951). Depths from 5 (Svalbard) to 995 m (Siberian Ice Sea) (Thorson 1944).

TARANIS Jeffreys, 1870
Type species (by monotypy):
Trophon moerchi Malm

TARANIS AMOENA (G.O. Sars)
Plate VII, fig. 4. Map 53.

Raphitoma amoena G.O. Sars, 1878: 220, pl. 17: 10a, b. Type locality: "ved Hasvig i Vestfinmarken."

Description of specimens

The shell is thin, very small (up to 7 mm long), and white. There are 6 slowly enlarging whorls and a pointed apex. There are up to 4 spiral carinae on the body whorl, which bears weaker spiral ribs as well. The callus of the almost straight columella is narrow, especially at the top. The rather wide aperture is a little more than $^1/_3$ the height of the shell. The crenulated outer lip, which has a deep anal notch, is expanded throughout most of its length. The canal is short and wide.

The shell of this species is recognized mainly by its small size and distinctive sculpture.

Origin of specimens

Northeast region:
Frobisher Bay—near settlement (1);
Prince Regent Inlet—Creswell Bay (2).
Specimens were collected alive on mud and clay at depths of 15-40 m.

Recorded for the first time from arctic Canada.

Also recorded from West Greenland, East Greenland, Jan Mayen, Svalbard, northern Norway (Thorson 1944); doubtfully Point Barrow, Alaska (MacGinitie 1959). Depths from 15-40 m (Creswell Bay) (this study) to 1187 m (north of Lofoten) (Thorson 1944).

SKENEA PLANORBIS (Fabricius)

This species is tentatively recorded by Wagner (1964: 11) from northwest of Ellef Ringnes Island. It is known from New Jersey to Greenland (Bousfield 1960) and from Norway to the Mediterranean (Thorson 1941).

ANACHIS HALIOETI Jeffreys

This species is tentatively recorded by Dall (1924: 34A) from Port Burwell, Hudson Strait. It is known up to Nova Scotia and Lofoten Islands, Norway (Verrill 1886).

CAPULUS UNGARICUS (Linnaeus)

This species is recorded from Hudson Bay by Pelletier *et al.* (1968: 575). Dr. F. Wagner said in a letter (1968) to Dr. A.H. Clarke that the record is based on a single empty shell collected between Coats and Somerset Islands. The species is known alive from Norway to the Aegean Sea (Thorson 1941) and New Jersey to Florida (Dall 1889).

BUCCINUM HUMPHREYSIANUM Bennett

Stimpson (1865: 387) listed this species from the mouth of the Mackenzie River and Verrill (1882: 498) referred to the record as *Buccinum gouldii*. I have examined one of Stimpson's specimens and some probable paratypes of Bennett's species and am of the opinion that the species does not inhabit North American waters but is found from the Mediterranean to the North Atlantic, off Norway.

BUCCINUM PHYSETMATUM Dall

This species is recorded in Dall's list (1921: 100) from Bernard Harbour, Arctic coast, west to Point Barrow and south to Bristol Bay, Alaska. The Canadian record is probably an error and MacGinitie does not record the species from Point Barrow.

CHRYSODOMUS SATURUS (Martyn)

Oldroyd (1927: 232) has erroneously given the type locality of this species as "King George Sound, Hudson Strait". Martyn actually described it from "K. Georges Sound", which has been shown by Hedley to be Nootka Sound, Vancouver Island.

MANGELIA RUFA (Montagu)

Walker (1862: 71) records this species from Port Kennedy (72°01'N, 94°14'W). Its occurrence is unlikely as this is quite out of the known range of the species (*see* Jeffreys 1867: 394).

The characteristics of Canadian arctic water masses have been described by Dunbar (1951), Bailey (1957), Grainger (1959), Collin (1962), and Pelletier *et al.* (1968). Much of the region is ice-covered for about seven months and the water temperatures are for the most part negative. In summer the temperature of the top hundred metres is between 0° and 3°C, reaching more than 9°C towards James Bay. Below this layer of water, the temperature in August varies from about −1° to −2°C. The salinity of the upper 100 meters, in August, is about 32‰ going down to less than 23‰ in James Bay. Below this layer of water the salinity varies from 32.5‰ to about 33.68‰. Variations in temperature and salinity of the upper layer of water are caused by melting and refreezing, wind-chill, run-off from the land, and ice movement. The extreme seasonal oscillation in light is an additional factor in this changing environment.

Animals living in the shallower waters of the region must be adaptable to changing temperatures and salinities and be able to take advantage of solar energy for growth and reproduction while it is briefly available. Many species of gastropods also store energy in the form of large yolky eggs or have 'nurse' eggs. The extensive ranges of about 80 per cent of arctic gastropods, chitons, and scaphopods (Macpherson 1968) is evidence of their high tolerance of environmental variation. For example, the presence of *Margarites costalis, Margarites olivaceus, Littorina saxatilis, Lunatia pallida, Buccinum tenue,* and *Admete couthouyi,* alive even in James Bay, suggests that adaptability to low salinities contributes to their wide distribution.

Gastropods form a very small proportion of the biomass of the arctic fauna. Thorson (1933: 49) shows that they represent less than 1 per cent by weight in the benthos in any of his epifaunal communities in Franz Joseph Fiord, East Greenland. In the Kara Sea, the gastropods form up to about 7 per cent by weight of the communities distinguished by Zenkevitch (1963: fig. 108). A higher proportion of the epifauna of marine algae, however, is composed of gastropods (Thorson 1933).

Most arctic gastropods bear thin, pale shells with low relief. Many have bristled periostraca, and most have a thin corneous operculum. The maximum sizes are plotted in figure 1. The maximum length of half the species is less than 25 mm; only in three species have shells of 100 mm or more been measured.

The maximum sizes of most species of marine gastropods in arctic Canada are similar to their maximum sizes in lower latitudes. In a few species of the family Buccinidae, however, the maximum size of specimens examined is smaller: for example, the shell of *Colus islandicus* from Foxe Basin measures about 100 mm and from off Newfoundland 120 mm; and that of *Buccinum totteni* from Hudson Bay measures 60 mm and from the Gulf of St. Lawrence, more than 80 mm.

An adaptation of some gastropods to northern waters is an acceleration of the larval growth rate. Dehnel (1955) found that the non-pelagic larvae of populations of some species of gastropods originating in high latitudes of the west coast of America grew two to ten times faster, when exposed experimentally to the same temperatures, than larvae of other populations of the same species from lower latitudes. Ecological adaptations of growth and metabolism in polar waters, with possible application to gastropods, chitons, and scaphopods, in animals of other phyla, are not treated here but are discussed by Thorson (1950), Zenkevitch (1963), and Dunbar (1968).

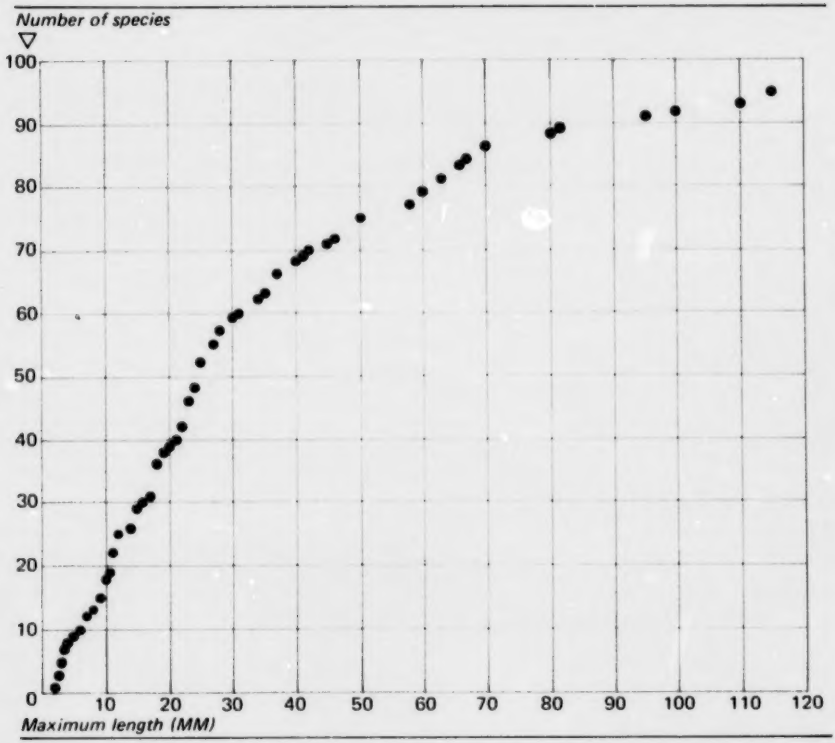


Fig. 1.

In East Greenland gastropods reproduce with perhaps a very brief pelagic stage (none were found) or hatch directly into the crawling stage (Thorson 1944). I did not search plankton samples from arctic Canada for gastropod larvae, but none were recorded by Grainger (1959) in plankton from Igloolik, Foxe Basin. It is expected, therefore, that most of the species in the region studied resemble those of East Greenland in this characteristic. Thorson (1950: 22-24) describes this adaptation and shows (Figure 5) that the proportion of species with non-pelagic development in the invertebrate fauna increases with latitude from the Canary Islands to East Greenland.

About 60 per cent of the chitons, scaphopods, and gastropods living in arctic Canada are known to be carnivorous. A similar proportion of carnivores is found when all but the species occurring north of Barrow Strait are eliminated from consideration. Thorson (1944) stated that 75 per cent of the gastropod species in East Greenland are carnivorous and demonstrated (1941: 132) that their proportion in the fauna increases from the Boreal to the Arctic.

The paucity of intertidal animals in arctic regions is said by many authors to be due to ice and its mechanical action on the shore. Ellis and Wilce (1961) discuss the effect of ice on littoral populations at various arctic stations. They found that ice can influence not only the numbers of littoral animals but the position of the zone in which they can live. They found the "Littorina" belt to be lower at Frobisher

Bay (Baffin Island) than in temperate regions. There are only thirteen species of gastropods and chitons recorded alive from west Hudson Bay, south of Chesterfield Inlet, whereas there are 32 species recorded on the corresponding parts of the east coast. This is perhaps partly due to the grounding and piling up of ice on the very shallow west coast.

Specimens of one third of the species of gastropods, chitons, and scaphopods were taken alive in 5 m of water or less. About a third of the species were found only in water less than 40 m deep in the region as defined. Another third were obtained alive only down to 100 m, and examples of the rest of the species came from below that level. No Canadian arctic collections available to me were from deeper than 270 m. A third of the species for which data were available were collected only on mud, sand, or clay. The rest were taken from both soft and rock bottoms.

Canadian arctic gastropods have been found in the digestive tracts of the following animals:

Myxocephalus quadricornis, east Hudson Bay (*Acmaea testudinalis* and *Margarites helicinus*).

Myxocephalus scopius, Dolphin and Union Strait (*Margarites helicinus*).

Gadus ogac, Hudson Bay (*Littorina saxatilis*).

Fish, Coronation Gulf and Frobisher Bay (*Margarites umbilicalis* and *Natica clausa*).

Erignathus barbatus, Dolphin and Union Strait (*Margarites costalis* and *Buccinum* sp.)

Somateria molissima, Dolphin and Union Strait and Coronation Gulf (*Buccinum* sp. and *Oenopota* sp.)

Other enemies of gastropods in arctic and temperate regions are fishes (e.g. Greenland shark, haddock, wolfish, eels, flounders, etc.), starfish, birds, walrus, and other molluscs (e.g. naticids).

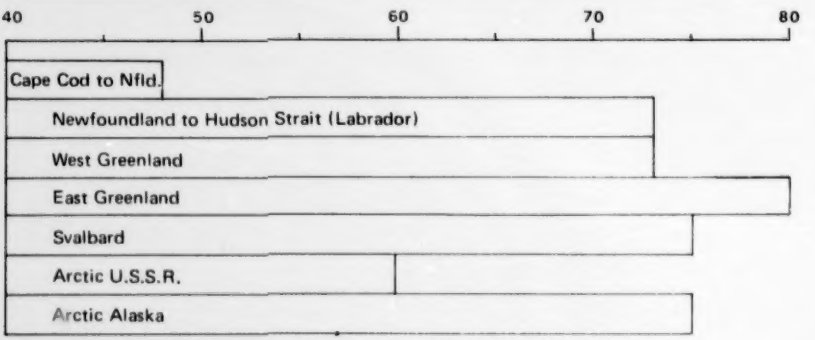


Fig. 2.

Number of species in common with arctic Canada shown as percentage of total number of species in arctic Canada.

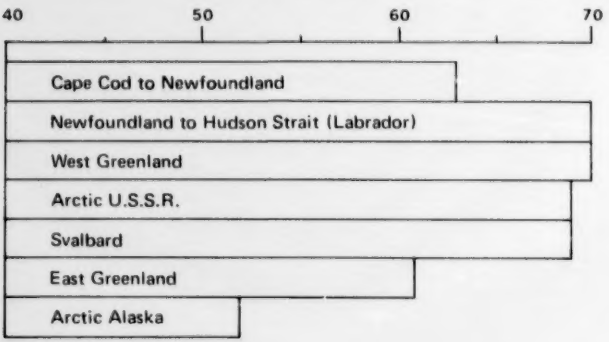


Fig. 3.

Number of species in common with arctic Canada shown as percentage of number of species in region considered.

The above figures compare the Canadian arctic gastropod, scaphopod, and chiton fauna with that of some other regions. Arctic Canada has about the same number of species in common with the four adjacent regions. Figure 2 shows that in regions with a large number of 'non-arctic' species the number of species held in common with arctic Canada forms a small proportion of the total.

Of the 108 species of chitons, scaphopods, and gastropods here recorded from Canadian arctic waters, 6 are known only as empty shells and 2 only from their type localities. More than one third (36) of the species recorded alive belong to the family Buccinidae. Another third comprise the families Turridae (14), Trochidae (9), and Lamellariidae (7).

Thirty-eight of the species recorded alive from arctic Canada, and whose ranges are known, have a circumpolar distribution. Ten have a discontinuous distribution, for example: absent from West Greenland (*Tonicella marmorea*), or not recorded on the Alaska side of Bering Strait (*Margarites helicinus*). Thus about half of the gastropods, scaphopods, and chitons are circumpolar in distribution or nearly so.

Many species have an 'Arctic-Atlantic' pattern of distribution: they are found in the north and east in arctic Canada and more or less continuously eastward to West Greenland (34 species), Norway (33 species), Svalbard (26 species), Barents Sea (21 species), Kara Sea (14 species), Laptev Sea (12 species), and Siberian Ice Sea (8 species). Most of the rest have an 'Arctic-Pacific' distribution and are found only in the west of arctic Canada, barely penetrating the Canadian Arctic Archipelago. Some range as far west as East Greenland (1 species) and Svalbard (4 species) and down to the Bering Sea (10 species). Grainger (1966) found similar patterns of distribution in echinoderms.

An examination of the distribution of some of the Canadian Arctic species will suggest where they came from and in a few cases may aid in determining the history of the region since glaciation. Species such as *Neptunea heros* probably penetrated the Canadian Arctic from the Pacific region, *Oenopota novajasemliensis* may be from the Arctic Ocean, and such species as *Boreotrophon fabricii* are evidently from the North Atlantic. According to Nesis (1962) some "amphiboreal" species of the northwest and Atlantic and north Pacific Oceans owe their present distribution to migration across the Arctic from west to east during the Pliocene. Known from the state of Washington to Point Barrow, Alaska, from Maine to Ungava Bay, and elsewhere only from Svalbard, *Colus spitzbergensis* may be one of these 'Pliocene relicts', which then more recently reinvaded the Low Arctic.

Buccinum glaciale donovani and the 'variety' *tornata* of *Neptunea despecta* were found only as empty shells. These large, rather thick-shelled and strongly sculptured forms are now found alive in the Gulf of St. Lawrence and the shells are distinguishable from those of the forms presently living in arctic Canada. A former, warmer period is suggested by these shells—especially by those of the latter, if the different forms of *Neptunea despecta* are in fact indicators of temperature regimes, as suggested by Golikov (1960). *Thesbia nana*, living in Hudson Bay, may be a relict of such a warmer period. Elsewhere it is known only as far north as Iceland.

"Arctic-Pacific" species

Boreotrophon pacificus *Buccinum angulosum* *Buccinum maltzani* *Buccinum polare*	—east to Dease Strait (approx. 106°W.)
Amauropsis purpurea	—east to Bathurst Inlet (approx. 107°W.)
Volutopsius deformis *Neptunea heros*	—east to Dolphin and Union Strait (approx. 115°W.)
Beringius beringi *Anomalosipho martensi*	—east to Cape Parry (approx. 125°W.)
Colus roseus	—east to Herschel Island (approx. 139°W.)
Neptunea beringiana	—to north coast of Victoria Island (approx. 112°W.)

Cosmopolitan in arctic Canada

Tonicella marmorea *	*Colus pubescens* *	
Lophyrochiton albus *	*Plicifusus kroeyeri* *	
Siphonodentalium lobatum	*Neptunea despecta*	
Acmaea testudinalis *	*Buccinum belcheri* *	
Lepeta caeca *	*Buccinum ciliatum* *	
Margarites helicinus *	*Buccinum moerchi*	
Margarites olivaceus *	*Buccinum hydrophanum* *	
Margarites costalis *	*Buccinum tenue* *	—Panarctic
Margarites umbilicalis *	*Admete couthouyi* *	
Lacuna glacialis	*Oenopota arctica* *	
Aquilonaria turneri	*Oenopota bicarinata* *	
Alvania cruenta *	*Oenopota cinerea*	
Trichotropis borealis *	*Oenopota incisula* *	
Velutina undata	*Oenopota pyramidalis*	
Velutina velutina *	*Oenopota reticulata* *	
Capulacmaea radiata	*Oenopota turricula* *	
Natica clausa		
Lunatia pallida *		
Solariella obscura		
Tachyrhynchus erosus		—low arctic
Boreotrophon clathratus		

"Arctic-Atlantic" distribution in Canada but also recorded from Alaska or Bering Sea so may prove to be cosmopolitan.

Puncturella noachina	*Boreotrophon truncatus* *	
Margarites vahli *	*Astyris rosacea*	
Moelleria costulata *	*Buccinum glaciale* *	—to Foxe Basin or north
Tachyrhynchus reticulatus		
Cingula castanea *	*Oenopota decussata*	
Trichotropis bicarinata	*Oenopota harpularia*	
Velutina plicatilis		
Solariella varicosa		—north to Hudson Strait
Colus spitzbergensis		

*collected alive in basin of Hudson Bay.

"Arctic-Atlantic" species		
Acmaea rubella	*Buccinum finmarkianum*	
Trichotropis conica	*Buccinum micropoma*	
Marsenina glabra	*Buccinum nivale*	
*Boreotrophon fabricii**	*Buccinum sericatum*	—to Foxe Basin or north
Volutopsius norvegicus	*Buccinum undatum*	
Colus islandicus	*Buccinum totteni**	
Colus tortuosus	*Oenopota declivis*	
Buccinum cyaneum	*Taranis amoena*	
*Littorina saxatilis**		—north to Cumberland Sound
*Margarites groenlandicus**		
Littorina obtusata		—north to Hudson Strait
"high-arctic" species		
Colus togatus		—also in southwest
Cingula moerchi		
Oenopota novajasemliensis		—not south of Prince Regent Inlet
Oenopota obliqua		
Poorly known		
Scissurella crispata		
Alvania janmayeni		
Onchidiopsis glacialis		—collected in only one locality
Amauropsis islandicus		
Beringius ossiani		
Anomalosipho verkruzeni		
*Thesbia nana**		
Acrybia glacialis		—recorded from type locality only
Onchidiopsis kingmaruensis		
Tonicella rubra		
Margarites pribiloffensis		
Lacuna vincta		—literature record, only one locality
Velutina lanigera		
Colus lachesis		
Buccinum plectrum		
Buccinum undulatum		
Volutomitra groenlandica		
Empty shells		
Cingula arenaria		
Volutopsius stefanssoni		
Oenopota elegans		—may be found alive
Hydrobia minuta		—north of present range
Acirsa costulata		
Aporrhais occidentalis		—probably post-Pleistocene fossils

*Collected alive in basin of Hudson Bay.

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Tonicella marmorea, Tonicella rubra, Lophyrochiton albus, Puncturella noachina, Acmaea testudinalis, Lepeta caeca, Siphonodentalium lobatum, Margarites costalis, Margarites groenlandicus, Margarites helicinus, Margarites olivaceus, Margarites umbilicalis, Solariella obscura, Lacuna glacialis, Littorina saxatilis, Tachyrhynchus erosus, Tachyrhynchus reticulatus.

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